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OTOMYCOSIS

TREATMENT WITH SILVER PICRATE

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HISTORICAL OBSERVATIONS

The science of bacteriology, which is so familiar, is of relatively recent origin, while the study of the fungi began centuries ago. The science of the study of the fungi, or mycetes, is known as mycology. The first recorded instance of observation of fungi is that of Hooke, who recorded his study made in 1677. While examining a rose leaf with a hand lens he found that the yellow spots seen grossly were made up of fungi. A few years later, in 1686, Malpighi described a fungus of the genus Mucedo, and Aspergillus was first described by Micheli in 1729.

During the remainder of the eighteenth century a number of botanists made a study of fungi, and during that century much progress was made in this science. In the nineteenth century the study of the parasitic fungi of man began to receive prominence. In 1839 Longenbeck discovered the thrush fungus at the autopsy table. Charles Robin left many records of his study of mycology, his book having remained classic. In 1843 he gave the name Oidium albicans to the organism Longenbeck had discovered four years before. Gruby discovered the fungus of ringworm in 1844.

In the latter part of the nineteenth century the study of bacteriology came to the front and made such rapid strides that mycology was forced into the background. This may partially account for the uncertain state of the classification of the fungi today.

CLASSIFICATION

An excellent classification was given by Castellani.[1]

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1. Castellani, A.: Fungi and Fungous Diseases, Chicago, American Medical Association, 1928.

. . . the *regnum vegetabile* [he stated] is usually divided into four large groups or phyla:

1. *Spermatophyta,* or seed plants.
2. *Pteridophyta,* or fern plants.
3. *Bryophyta,* or moss plants.
4. *Thallophyta,* or thallus plants.

Thallophyta, to which the fungi belong, are generally filamentous plants, of simple cellular structure, which differ from other plants in that they do not develop a complex plant—body with differentiation into roots, stem and leaves.

Thallophyta are separated into two large subdivisions:

1. *Algae* Roth, 1797, chlorophyl present.
2. *Fungaceae* Linneaeus, 1737, . . . chlorophyl absent.

Fungaceae . . . may be separated into three large divisions:

(*a*) Bacteria, or lower fungi (*Schizomycetes*), unicellular plants, of minute dimensions, which multiply usually by cell fission.

(*b*) Fungi *sensu stricte,* higher fungi, mycetes (*Eumycetes*), unicellular or pluricellular filamentous plants, of larger dimensions than bacteria, which multiply by processes other than simple cell fission, usually by means of asexual or sexual spores.

(*c*) Vegetative body, a multinucleate naked plasmodium—*(Myxomycetes),* not found in man.

The study of the lower fungi, or Schizomycetes, Castellani explained, is now called "bacteriology," while that of the higher fungi, or Eumycetes, is termed "mycology."

The Eumycetes are subdivided into four large classes. Into these classes fall the fungi which are parasitic of man, as outlined by Castellani.

The following definitions, too, were given by Castellani:

. . . a fungus consists of (1) a vegetative part (thallus, mycelium) devoted to the acquisition of food; (2) a reproductive part. The vegetative part consists of fine filaments or threads called "hyphae;" a collection of hyphae is known as mycelium. . . . A hypha is a hollow cylindric tube containing protoplasm and divided at intervals by partitions called "septa." It may be of different shapes, straight, curved or banana-like.

On the subject of the reproduction of fungi, Castellani had this to say: the reproductive part, or the spore, is

merely a spheric, oval or elongated cell with a thin wall and containing protoplasm. A spore may multiply by budding, producing daughter spores identical with the parent spore; [or] . . . it may germinate by growing out a filament or hypha, which develops into a mycelium.

The spores belong to two types: those that are sexual in origin, and those that are asexual in origin. The asexual spores are those which are not the result of fusion of two sex cells or gametes. Practically all fungi produce asexual spores; some produce both sexual and asexual spores.

"Fungi are classified principally," Castellani went on the say, "according to the manner in which the spores are produced, their shape and their color." The principal kinds of spores he classified as follows:

1. *Gonidia* (endospores, . . . ascospores).—These spores are not born free; they are formed usually by a highly complicated process, or born in a case or receptacle, or saclike cell, which is often terminal. . . .
2. *Zygospores.*—These spores result from a conjugation of two cells (gametes) that are morphologically identical in shape, and do not show any sexual differentiation. . . .
3. *Oöspores.*—These result from the conjugation of two sexually differentiated elements. . . .
4. *Conidia* (or exospores).—These spores are born free, not in a saclike cell or case, or receptacle; the branch bearing them is called a conidiophore. Conidia originate asexually from the mycelial threads by a process of budding, septation or abstriction. . . . True [free] conidia [are] found . . . in *Aspergillus* and *Penicillium*. . . .
5. *Thallospores.*—A thallospore is merely a portion of the thallus, or vegetative body, that becomes secondarily adapted to the purposes of reproduction. There are several varieties of thallospores, the principal ones being:

   The blastospore, which is oval or roundish, formed by . . . budding.

   The arthrospore, or mycelial spore, is formed simply by the segmentation and disarticulation of a hyphal element or mycelial thread.

   The chlamydospore is merely an arthrospore of large size that is undergoing encystment.
6. *Hemispores.*— . . . these are the true reproductive spores.

The four classes into which the Eumycetes may be divided are as follows (Castellani's classification):

Class I: Reproduction by freeborn spores (conidia) that are never concontained in a case or receptacle; septate mycelium— . . . *Hyphomycetes.*

Class II: Reproduction by ascospores; mycelium septate when present—*Ascomycetes.*

Class III: Mycelium nonseptate in vegetative stage; reproduction by zygospores—*Phycomycetes.*

Class IV: Reproduction by basidiospores, septate mycelium—*Basidiomycetes.*

More details and the further subdivision are given in Castellani's book.

Clinically the fungi may be classified into two groups:

1. Saphrophytic: found in nature.
2. Parasitic: found in man.

The greater number are found in nature; for example, moldy bread may be due to Mucor, or Penicillium, the latter being found also on decomposed fruit. Aspergillus may be found on leather in damp weather or on straw. Numerous other examples could be mentioned. King Gill [2] stated that seventeen species of fungi had been reported as pathogenic for man and that ten different species had been found in conditions of the ear. The fungi most frequently found in the ear are the Aspergilli, which include Aspergillus niger, Aspergillus wentii, Aspergillus glaucus

2. Gill, K.: Otitis Externa Mycotica, Arch. Otolaryng. **16**:76-82 (July) 1932.

and Aspergillus fumigatus, Penicillia, Mucoraceae, Monilia and the organisms responsible for tinea. Sporotrichi and Leptothrix have also been found.

It has been pointed out repeatedly that otomycosis is more prevalent than has been taught. As proof of this, many of the examples of that disease that I have seen have been overlooked entirely or have been treated for some other condition than the true one.

Most of the texts on otolaryngology deal with this subject briefly. Beck,[3] in the text edited by Jackson and Coates, stated that otomycosis, or otitis externa parasitica, is comparatively rare and that the etiologic fungus is not definitely known but that the disease is believed to be due to A. niger and A. glaucus. The condition, he said, is fairly resistant to treatment. Barnhill[4] in his text stated: "Ear molds are found in the external auditory meatus in about one of every five hundred ear cases." Kerrison[5] said the fungus may remain long in the meatus and produce absolutely no symptoms.

Turner[6] stated he found this condition to be rare in England. He said that he treated it by syringing and by instillation of an alcoholic solution of mercury bichloride. All of the other authors cited mentioned the use of salicylic acid in alcohol.

These texts are all a number of years old, and the recent literature has taught many new things concerning otomycosis, such as the greater frequency of its occurrence and better methods of treatment. The use of salicylic acid and alcohol was advised by Bezold and is still practiced the world over, but McBurney and Searcy[7] demonstrated that there are at least thirty-one different solutions with a greater fungicidal power than salicylic acid in alcohol.

SYMPTOMS

Otomycosis is associated with the following symptoms:

1. Itching of the external canal. This may be mild or severe, intermittent or constant, but is probably present in all cases.

2. A sense of fulness, due to mechanical obstruction of the canal by the mass of mycelium and desquamated epithelium.

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3. Beck, J., in Jackson, C., and Coates, G. M.: The Nose, Throat and Ear and Their Diseases, Philadelphia, W. B. Saunders Company, 1929, p. 402.

4. Barnhill, J. F.: The Nose, Throat and Ear, New York, D. Appleton and Company, 1928, p. 448.

5. Kerrison, P.: Diseases of the Ear, ed. 4, Philadelphia, J. B. Lippincott Company, 1930, p. 117.

6. Turner, L.: Diseases of the Nose, Throat and Ear, Baltimore, William Wood & Company, 1936, p. 318.

7. McBurney, R., and Searcy, H. B.: Otomycosis: An Investigation of Effective Fungicidal Agents in Treatment, Ann. Otol., Rhin. & Laryng. **45**:988-1008 (Dec.) 1936.

3. Loss of hearing, also due to obstruction of the canal. It may be associated with tinnitus.

4. Aching or dull pain. This symptom may be present but does not always occur.

5. Discharge. Many patients complain of a discharging ear, which is due entirely to the condition in the external canal.

FINDINGS

Furuncles and secondary infection frequently occur, due to mechanical irritation and trauma produced in an attempt to relieve the itching or to bacterial invasion of the underlying structures.

Hatch and Row,[8] who reported 22 cases of aspergillus infection observed during one month of the rainy season in a hospital in Bombay, India, divided the conditions into two types: (*a*) wet, with discharge and furuncles, and (*b*) dry, with crusts. Most of the lesions I have seen have been of the moist type. The moist mass filling the ear has been described by various writers as having the appearance of wet blotting paper, of wet newspaper or of wet cotton, as a mealy, pultaceous mass and as a pulpy mass.

A portion of this mass is made up of macerated epithelium. W. D. Gill[9] once said that normal cerumen seemed to him to be absent in cases of this disease and that one is led to believe that normal cerumen inhibits the growth of fungi. However, three years later Castellani[1] said the presence of fungi may apparently facilitate the formation of a wax plug. W. D. Gill[10] later stated: "The presence of cerumen in the ear apparently exerts a restraining influence against invasion with fungi, but this is not always true, for instances have been encountered in which fungi were actually growing on a ceruminous plug."

According to my experience, cerumen does not often occur, but fungous growth has been observed on a wax plug. Although cerumen is not ordinarily found,[9] it may be present. Inflammation of the external canal is frequently found. The tympanic membrane may be inflamed, thickened or perforated. If secondary pyogenic infection has complicated the picture there may be a foul discharge or furunculosis.

In the dry type of this infection the mass is not so large. There is a tendency toward scales, scabs and crusting. However, the canal may be found filled with this dry debris.

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8. Hatch, W. K., and Row, B.: Fungus Disease of the Ear, Lancet **2**:1561-1564, 1900.

9. Gill, W. D.: Mycotic Infections in Otolaryngology, Texas State J. Med. **31**:272-278 (Aug.) 1935.

10. Gill, W. D.: Mycotic Infections in Otolaryngology, South. M. J. **31**:678-685 (June) 1938.

PATHOLOGY

It is possible for the fungus to be present in the ears without causing symptoms or producing any pathologic changes, but if any water enters the ear trouble begins. Outbreaks are frequently seen soon after the swimming season opens. Maceration occurs; the fungus grows, and actual penetration of the skin by the mycelium may occur. There may be simply inflammation of the lining of the canal and the tympanic membrane.

If secondary pyogenic invasion has occurred it may produce marked general swelling of the canal, or the condition may be localized as a furuncle, single or multiple. Perichondritis together with marked destruction has been reported. Extension to involve the skin of the face may occur.

Castellani stated the opinion [11] that there are two factors which act in producing the pathologic condition: (1) the mechanical irritation and (2) a chemical irritation produced by toxins secreted by the fungus. This toxin [11] may cause intense reaction in the skin of the canal and lead to necrosis and perforation of the ear drum. Plaut [12] made the statement that when there is involvement of the tympanic membrane the disease occasionally leads to perforation. Chisolm and Sutton [13] reported 2 such cases in their series. Salzberger,[14] in discussing complications of otomycosis, said: "Perforation of the tympanic membrane and invasion of the middle ear and mastoid cells may occur." Trexler,[15] working in Hawaii, reported treating 10 patients with perforated tympanic membranes, who said they had not had any previous signs or symptoms of otitis media. He said he felt that this was "far too large a number to be regarded as purely incidental." He added: "In each case the drum membrane appeared gray and thickened, and the sensitivity was markedly decreased." He stated the opinion that the condition may have resulted from the symbiotic action of the fungi plus the bacteria. W. D. Gill [9] did not observe this in his report. Mycotic infection may occur in the middle ear complicating an already existing otitis media.

DIAGNOSIS

From the symptoms and characteristic physical findings the diagnosis is simple, if one is thinking of this condition. Some of the conditions

11. Castellani, quoted by Chisolm and Sutton.[13]

12. Plaut, quoted by Chisolm and Sutton.[13]

13. Chisolm, J. J., and Sutton, A. C.: Otomycosis: Report of Nine Cases Treated with Potassium Iodide, Arch. Otolaryng. **2**:543-556 (Dec.) 1925.

14. Salzberger, M.: Aspergillus niger als Ursache von Chrerkrankungen in Palästina, Monatschr. f. Ohrenh. **63**:448-454 (April) 1929.

15. Trexler, C. W.: Otomycosis in Hawaii, Laryngoscope **45**:106-109 (Feb.) 1935.

which might be confused with it are [16] furunculosis, chronic otitis media, impacted cerumen, foreign bodies in the external canal and some types of diffuse otitis externa.

To identify the organism the examination of an unstained wet mount under the low power is a quick, convenient method available to any one with a microscope. Sodium hydroxide in a 10 per cent solution for the wet mount has been universally used for years, but Cornbleet [17] found an alcoholic solution of sodium sulfide to be superior. This solution is the best keratin dissolvent; the relationship which it produces between the refractive index of the organism and solvent is the optimum for visibility and the sodium sulfide reagent clears the solution sufficiently in five to ten minutes, while sodium hydroxide may take several hours to produce satisfactory clearing. Sodium hydroxide, moreover, may dissolve certain fungi.

To culture the fungus Sabouraud's medium may be used. Its hydrogen ion concentration is adjusted to inhibit bacterial growth and to favor fungous growth, which is best between the levels of 4 and 6.

The organism is incubated at room temperature and a good growth frequently occurs in a few days, but the culture should not be reported negative until after two weeks.

CASES REPORTED IN THE LITERATURE

Reference has already been made to the report of Hatch and Row,[8] who tabulated 22 cases observed in one month. They described the symptoms and findings in each case. They expressed the opinion that the most important part of treatment is the maintenance of cleanliness and dryness, which are gained by irrigation and by the use of iodoform and boric acid powder in equal parts.

In a comprehensive paper on the subject of otomycosis, Chisolm and Sutton [18] first reported the use of potassium iodide in the treatment of 9 patients. They outlined their plan of treatment as follows:

1. Oral administration of potassium iodid, beginning with 5 grains [0.32 Gm.] three times a day, and increasing gradually to 15 grains [0.97 Gm.] or more three times a day. This course to be continued until the symptoms are relieved and the ear is free of discharge.
2. A period of ten to fourteen days, preferably under observation, during which time the patient takes no potassium iodid but is instructed to wipe out the canal daily with alcohol or with a 2 per cent solution of salicylic acid in alcohol.

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16. Bristow, W. J.: Otomycosis: A Clinical Consideration, Ann. Otol., Rhin. & Laryng. **41**:578-583 (June) 1932.

17. Cornbleet, T.: Reagent for Demonstrating Fungi in Skin Scrapings, J. A. M. A. **95**:1743 (Dec. 6) 1930.

3. A fourteen day course of potassium iodid then follows, beginning with 10 grains [0.65 Gm.] three times a day and rapidly increasing to the maximum dosage the patient can tolerate.
4. Rest for two weeks and repeat the fourteen day course of potassium iodid. In obstinate and long standing cases two week courses with two week intervals between should be continued for at least six months.
5. It is important that no water should be allowed to enter the canal at any time and that no oils or ointments should be used in the ear.

They added that probably the potassium iodide prevents the spores from developing, rather than killing them, and stated also:

The interval between courses allows the spores to develop into mycelia which are then killed by the next course. . . . When the fungus is growing superficially it can be cured by local measures only. When it has penetrated beneath the skin we believe potassium iodid to be essential.

In 1938 Whalen [18] had this to say on the subject:

In all cases of fungous infection, whether localized or systemic, the iodides are of definite value. They have been used for so many years in the treatment of various obscure conditions that it is surprising that their action is not more clearly understood. It is possible that the action of the iodides is the same as that of the sulfanilamide group in fixing the toxin eliminated by bacteria or fungi. Potassium iodide has been found to be the most satisfactory form by which to obtain the effect of iodine. The initial dose of 15 grains (1 Gm.) a day is rapidly increased to 30 grains (2 Gm.) and is given for thirty days. When sodium iodide is used, 15 grains is given intravenously every three days.

Miller [19] reported 2 cases of injection with Aspergillus niger, both being of females who gave histories of having used olive oil in the ears. One patient was treated for some time by irrigation and the use of hydrogen peroxide, as well as with boric acid in a 50 per cent solution of alcohol. The condition went from bad to worse, and secondary bacterial infection developed. Miller reported permanent cure achieved by the use of salicylic acid in alcohol.

Bahre and Hansen [20] reported a case of otomycosis on the basis of Sporothrix. Fifty years ago, they wrote, Siebenmann expressed the opinion that most otomycosis is due to the Aspergilli. Bahre and Hansen found that infection due to Streptothrix is apparently more severe in its complications than is that due to one of the Aspergilli, producing destruction in the middle ear, and that it may even cause death. It tends to have remissions and exacerbations. Sporothrix infection, they said, occupies a middle position between the severe Streptothrix disease and the milder

18. Whalen, E. J.: Fungous Infection of the External Ear, J. A. M. A. **111**: 502-504 (Aug. 6) 1938.

19. Miller, J. W.: Otomycosis: Its Relative Frequency, J. A. M. A. **88**:1077 (April 2) 1927.

20. Bahre and Hansen: Otomycose auf Grund einer Sporothrixininfection, Arch. f. Ohren-, Nasen- u. Kehlkopfh. **121**:136-139 (May) 1929.

aspergillus condition. A report of the case of Sporothrix infection presented by Bahre and Hansen follows (a free translation from the original article).

REPORT OF A CASE

A woman was hospitalized for follicular angina. She later complained of itching and pain in the left ear. Examination showed the external canal to be covered with a greenish gray mold. The outer canal and surrounding skin were found to be much reddened from inflammation. The picture suggested Aspergillus. The next fourteen days the reddened infiltration spread all the way across the face from the ear. A culture on Sabouraud's medium revealed Sporothrix. In six to eight weeks the infiltration of the skin of the face receded, but the skin of the external canal became necrotic, and for fourteen days the outer canal was covered with bloody granulations.

In the necrotic mass one could identify the fungus with hematoxylin-eosin stain. The exact cause of the infiltration of the face was not determined, but it was thought to be a question of one of three things: (1) erysipelas, (2) fungous infiltration or (3) toxic origin. In order to establish the cause two biopsies were made at fifteen day intervals. The tissues were cultured but were sterile for fungus. The report on the histologic examination was that there was no change except inflammatory reaction. The final decision was that the condition was a toxic cutaneous reaction, secondary to the mycotic infection of the ear. (A color plate of this case accompanies the original article.)

Treatment and Course.—A 2 per cent solution of salicylic acid in alcohol was placed in the external canal twice daily and allowed to remain for ten minutes. The fungus disappeared in three to four days, but the complications on the face were slower in being relieved and were treated with boric acid ointment. The face healed spontaneously in seven weeks, but the aural canal did not heal for three months.

Castellani [21] mentioned that a fungus belonging to the family Mucoraceae, Lichtheimia ramosa, Lindt 1886, is often found in the nasal mucus of horses. He reported finding a fungus belonging to this family in 2 patients with otomycosis. Both of them were horse keepers. He said that the best treatment he had found was syringing with hydrogen peroxide (2 parts) and alcohol (1 part), provided a severe inflammation is not present. He also mentioned mercurochrome and a solution of methylene blue (methylthionine chloride U. S. P.) as well as an alcoholic solution of salicylic acid.

Thévenard [22] reported a case of a 45 year old physician who complained of intense itching of the external canal associated with slight exudate and sufficient desquamation to fill the canal. Treatment with silver nitrate was given with little success. The culture showed the growth to be due to A. fumigatus. The lesion was cured with oil of cade. There was a history of a mycotic infection of the skin of the axilla, but the type of organism producing it was not established. Thévenard

21. Castellani,[1] p. 135.

22. Thévenard, A.: Un cas de mycose du conduit auditif, Oto-rhino-laryng. internat. **12**:171 (April) 1928.

made the suggestion that there may have been a connection between the two but said he could not be sure. About the same time Père [23] reported a case of infection with A. fumigatus and one of infection with A. niger.

Bernfeld,[24] in a study of aspergillosis in Palestine, reported 8 cases in some detail, and he observed, as did Siebenmann in mid-Europe, that the condition was more prevalent during the summer than during cooler weather. In a similar study Salzberger,[14] working in Palestine, found that the disease occurred more often during the rainy season and predominantly in women who do the cleaning of the walls in the houses. He expressed the opinion that the fungi may be present on the walls of the houses in damp weather and may be transferred easily to the ear.

Salzberger observed that aspergillosis is usually unilateral but that it may be bilateral. Frequently on one side it is severe, while on the other it is just beginning. It usually is cured easily but may be chronic. He advised repeated irrigations for mechanical cleansing, followed by drying the ear and using boric acid powder, which relieves the pain and allows inflammation to subside. He followed this part of the treatment with the use of a 1 per cent solution of boric acid in alcohol daily for one month to kill the rest of the spores.

Viéla [25] in describing the symptoms mentioned that vertigo may occur as a result of pressure of the plug on the tympanic membrane. Otomycosis, he said, is much more frequent than most people realize. He classified cases according to 4 clinical forms of the disease, viz.: (1) pseudoceruminosis, (2) pseudocholesteatoma (may be combined with true cholesteatoma), (3) pseudo-otorrhea (may be associated with pus originating in the middle ear) and (4) pseudoeczema. The prognosis is good, he said, if the condition is treated, but if it is neglected it may last for months or years, with remissions. Viéla divided treatment into three parts; a free adaptation of his outline follows:

1. Parasiticide: In order to kill the parasites beneath the skin, which if allowed to live will cause the condition to recur in six to eight days, the following procedures are expedient:
   (*a*) Careful cleansing of the lamella from the external canal, followed by thorough drying.
   (*b*) Instillation of salicylic acid in alcohol or of absolute or diluted alcohol,
   or
   (*c*) Use of a bicarbonate of soda solution with a bichloride of mercury solution, oil of cade and potassium permanganate in a dilution of 1:1,000 or 5 or 10:1,000 two times a day for ten minutes, which usually cures the lesions in eight to ten days.

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23. Père, M.: Deux cas de mycose du conduit auditif, Oto-rhino-laryng. internat. **13**:149-158, 1929.

24. Bernfeld, K.: Zur Otomykosis aspergillosa in Palästina, Monatschr. f. Ohrenh. **63**:200-202 (Feb.) 1929.

25. Viéla, A.: L'otomycose: Etude anatomo-clinique et thérapeutique, Oto-rhino-laryng. internat. **15**:527-533 (Nov.) 1931.

2. Insufflation of boric acid powder.
3. Painting of the canal with tincture of iodine or silver nitrate in a dilution of 1:10.

It is necessary, he said, to observe the patient for four to six months for recurrences.

Trexler,[15] in discussing otomycosis in Hawaii, said the role played by fungi as pathogens for man is of far more serious import than is generally recognized. He conservatively estimated 50,000 to 100,000 cases in the territory of Hawaii. He expressed the opinion that it probably is a frequent cause of deafness in the tropics. He observed the Aspergilli most frequently, but other fungi noted were, Furfur, Mucor and Penicillium. He found that daily syringing for a week, repeated at intervals for two months, and the instillation of a 1 to 2 per cent solution of salicylic acid in alcohol gave satisfactory results. The use of a 2 to 4 per cent solution of thymol in castor oil and sodium thiosulfate is also mentioned.

Kulvin[26] found the factors predisposing to the development of fungus in the ear to be: "(1) traumatism of foreign bodies or scratching; (2) coincidental pyogenic infections; (3) maceration of the canal wall epithelium, and (4) the indiscriminate habit of dropping oil in the ear on every complaint of pain in the ear may have some bearing in the development of the mycosis." (Most of the writers mentioned the use of oil in the ear as one of the factors in producing this condition. However, Enlows[27] had this to say on the subject: "Oil was long considered a factor in the inception or progress of otomycosis. [But] Miller and others have shown that this is not the case.") Kulvin reported a case of otomycosis due to A. nigricans. The symptoms were itching of the ears and dizziness. He observed the canals to be filled with a secretion, "not at all like the purulent discharge of an otitis media, but one which appeared like moist paper packed in the canal." He treated the growth by the use of 95 per cent alcohol and then of 1 and 2 per cent solutions of salicylic acid in alcohol. Treatment was given daily; it was painstaking, laborious and persistent, the patient being under care from November 16 to the next February 5 with evidence of recurrences during that time. She was advised to continue treatment for several weeks or months under her own physician's care. Had specific fungicides, as they are known today, been used, perhaps the results of treatment would have been better.

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26. Kulvin, M. M.: Otomycosis, M. Bull. Vet. Admin. **11**:361-362 (April) 1935.

27. Enlows, E. M. A.: Mycotic Diseases of the Ear, M. Ann. District of Columbia **4**:217-222 (Aug.) 1935.

Pinkerton and MacQuiddy [28] reported 2 cases of infection caused by Scopulariopsis, proved such by culture. This organism is a filamentous fungus similar in structure and action to Aspergillus and Penicillium. The cultures demonstrated mild animal pathogenicity. Simms [29] reported 3 cases in which aspergillus infection was treated with a 1 per cent solution of mercuric iodide in 50 per cent alcohol. He reported the conditions cured in three days, three weeks and two days respectively. He mentioned the fact that the disease may be associated with the occupation of the patient, such as grain handling, hair sorting or working in a damp moldy cellar or in a dusty atmosphere. One wonders if aspergillosis can be considered cured after only two or three days of treatment.

Chiniara [30] reported 8 cases of otomycosis due to Sterigmatocystis nigra, saying the fungus has been improperly classed clinically by some as A. niger. The treatment was with an alcoholic solution of iodine, which is considered classic. The use of copper sulfate and silver nitrate is also mentioned.

Tempea,[31] in discussing treatment of otomycosis, expressed the opinion that tincture of iodine is a specific agent even as quinine is for malaria and neoarsphenamine for syphilis and as salicylates are for rheumatism. He said that he formerly used iodides internally but had abandoned that method in favor of local applications of iodine used in connection with irrigation of the canal.

Engel [32] reported a case of otomycosis due to A. niger in a young woman who said she had cleaned her ear with a plant stalk. Afterward there was some loss of hearing together with itching of the canal. Examination showed redness of the canal without desquamation. There was a grayish spot on the anterior part of the tympanic membrane, which had a black center. This spot was easily removed by washing the ear. The rest of the tympanic membrane was normal. The patient had been treated previously by the use of silver nitrate in the ear. The hearing was normal after removal of the mass on the tympanic membrane and drying of the ear. In two days the hearing was again impaired and itching had returned, and the patient felt as if the ear was filling up gradually. Examination showed the canal to be hyperemic and the tympanic

28. Pinkerton, M. E., and MacQuiddy, L. L.: Scopulariopsis in Otomycosis, Laryngoscope **46**:670-673 (Sept.) 1936.

29. Simms, R. F.: Aspergillus Infection as the Cause of External Ear Diseases, South. M. J. **30**:1224-1225 (Dec.) 1937.

30. Chiniara, J.: Otomycoses à stérigmatocystis nigra, Ann. d'oto-laryng., June 1937, pp. 498-506.

31. Tempea, V.: Le traitement de l'otomycose par la teinture d'iode, Ann. d'oto-laryng., March 1937, pp. 215-218.

32. Engel, R.: Un cas d'oto-mycose à "Aspergillus niger": Traitement, Oto-rhino-laryng. internat. **22**:134-135 (March) 1938.

membrane to be covered again with a whitish mass, also adherent to the canal wall. White and black flakes were again removed by the use of forceps and by irrigation. The diagnosis was otomycosis due to A. niger in the external canal. Treatment was with a solution of silver nitrate, in a concentration of 1 : 30 in the ear, and with iodides internally. Engel later used collargol (a proprietary preparation of colloidal silver and silver oxide stabilized with derived egg albumin), 1 : 10, and also compound solution of iodine U. S. P. and a solution of mercury bichloride (Van Swieten's solution) without success. All of these remedies were taken badly by the external canal; they were therefore replaced by insufflations of zinc peroxide, but none of them had any effect on the fungus. The condition became gradually so severe that the mass could hardly be removed by irrigations. The myringitis was intense, and there were headaches and a constant oozing from the canal. Engel next tried a 2 per cent solution of mercurochrome, which diminished the inflammation. He then used a solution (1 : 10) of crystal violet (methylrosaniline N. F.) acidified with lactic acid. This relieved the local symptoms, stopped the discharge and diminished the desquamation. Four days later the tympanic membrane was free of desquamation and the hearing normal. Eight days after the last application of crystal violet, the cone of light was visible and there was no desquamation.

TREATMENT

To many practitioners the treatment of fungous infection of the ear means the use of salicylic acid and alcohol. This was first advocated by Bezold and is still found in the texts and literature. Recent experimental work has provided many more specific remedies.

Myers,[33] in 1927, working with a yeast infection of the hands of fruit handlers in the Northwest, was the first to demonstrate the effect of thymol on the fungi. He found that thymol, its isomer carvacrol and the volatile oils of mustard, cinnamon and clove possess marked fungicidal powers. A saturate aqueous solution of thymol killed the yeast in less than fifty seconds. He also found that powdered thymol in capsule, administered by mouth, is apparently absorbed and circulated in sufficient strength to have pronounced fungicidal action, according to cultural results supplemented by roentgenographic and physical observations in 2 cases of pulmonary moniliasis and 1 of actinomycosis.

Searcy and McBurney[34] reported, in 1929, the use of thymol in treatment of otomycosis. Since that time they have reported[7] on the

33. Myers, H. B.: An Unappreciated Fungicidal Action of Certain Volatile Oils, J. A. M. A. **89**:1834-1836 (Nov. 26) 1927.

34. Searcy, H. B., and McBurney, R.: Tr. Alabama State M. A., 1929; cited by McBurney and Searcy.[7]

relative fungicidal action of the various drugs which have been employed to treat this condition. The method used for the tests was that outlined by Allen and Wright,[35] viz. the agar cup plate method of determining the value of antiseptics. The results obtained for each drug tested were compared with those produced by a 5 per cent phenol solution, and the representation of the comparison was designated as the "phenol ratio," or "Pr.," "which gives a whole number for expressing relative diffusibility and germicidal action." The following tabulation (quoted from their article [7]) gives the results of the tests (figures under "R" indicate the relative order of effectiveness, or "Relative Rank"):

ACTION OF VARIOUS SUBSTANCES UPON SOME ASPERGILLI FOUND IN OTOMYCOSIS

Averages of Organisms N, W, G, F, Arranged in Order of Effectiveness

No.	Substance Employed	Pr.	R.
1.	Thymol-cresatin-alcohol	2.6	1
2.	Cresatin	2.55	2
3.	Thymol-merthiolate, 45, alcohol 95%	2.5	3
4.	Thymol-alcohol, 95%	2.5	3
5.	Castellani's solution	2.5	3
6.	Castellani's solution, thymol	2.43	4
7.	Thymol-alc., 70%	2.42	5
8.	Thymol, 2% aq. emulsion	2.1	6
9.	Merthiolate tincture, 1:1,000	1.97	7
10.	Thymol-alcohol, 50%	1.95	8
11.	Merthiolate solution, 1:1,000	1.95	8
12.	Carbolic, 12% in glycerine	1.95	8
13.	Thymol-gasoline	1.95	8
14.	Iodine tincture	1.88	9
15.	Carbolic, 10% in olive oil	1.82	10
16.	Metaphen tincture, 1:200	1.73	11
17.	Thymol-sodsol	1.55	12
18.	Zinc oxide-boric, eq. pts.	1.44	13
19.	Thymol-boric-iodide	1.4	14
20.	Alcohol-boric (Sat. solution)	1.1	15
21.	Thymol, 2% in yellow oxide of mercury	1.01	16
22.	Phenol	1.0	17
23.	Silver nitrate aq.	0.97	18
24.	Methylene blue, sat. alc.	0.96	19
25.	Phe-mer-nite, 1:3,000-R.	0.91	20
26.	Sodsol (naphtha)	0.9	21
27.	Mercurochrome, 5% aq.	0.9	21
28.	Phe-mer-nite, 1:1,000-G	0.89	22
29.	Mercurochrome, 2% aq.	0.61	23
30.	Phe-mer-nite ointment	0.6	24
31.	Phe-mer-nite, 1:2,000-G	0.57	25
32.	Fowler's solution	0.55	26

35. Allen, A. B., and Wright, I. S.: Determination of the Value of Antiseptics, J. A. M. A. **96**:920-925 (March 21) 1931.

33.	Tinct. metaphen, 1:2,500	0.52	27
34.	Silver nitrate, glycerine, alcohol (95%)	0.47	28
35.	Whitfield's-alcohol (95%)	0.45	29
36.	H_2O_2, 3%	0.30	30
37.	Mercury bichloride, 0.04% aq.	0.23	31
38.	H_2O_2-alcohol, 2%, in alcohol 95%	0.2	32
39.	Salicylic, 2%, in alcohol, 95%	0.2	32
40.	MgO-salicylic, eq. pts.	0.2	32
41.	Hexylresorcinol, S. T. 37	0.17	33
42.	Pepsodent antiseptic	0.15	34
43.	Listerine	0.1	35

N.—Aspergillus niger.
W.—Aspergillus wentii.
G.—Aspergillus glaucus.
F.—Aspergillus fumigatus.

Castellani's solution, mentioned in the tabulation, consists of: basic fuchsin, 1 Gm.; boric acid, a saturated aqueous solution, 1 cc.; resorcinol, 10 Gm., and alcohol (95 per cent), 10 cc.

The following list is also quoted from McBurney and Searcy:[7]

SUBSTANCES USED OR ADVOCATED FOR USE IN OTOMYCOSIS, THE FUNGICIDAL EFFECT OF WHICH HAS PROVED NEGATIVE IN ALL INSTANCES WHERE TRIED BY THE CUP PLATE METHOD ON A. WENTII, NIGER, GLAUCUS AND FUMIGATUS RESPECTIVELY

1.	Alcohol, absolute.	
2.	Alcohol, 95%.	
3.	Alcohol, 70%.	
4.	Alcohol, 50%.	
5.	Alcohol, 40%.	
6.	Alcohol, 30%.	
7.	Copper, sulphate, 1:240.	
8.	Carbolic aq.—	Carbolic, gtt. V. aq. oz. 2.
9.	Carbolic aq.—	Carbolic, gtt. V. aq. oz. 1.
10.	Calcium hypochlorite, grs. 2	Aq. oz. 1.
11.	Glycerine-aq.—zinc sulphate	Glycerine—H_2O eq. pts. oz. 1. $ZnSO_4$, grs. 2.
12.	Mercury Bichloride	$HgCl_2$ aq. 1:300,000.
13.	Potassium permanganate	$KMnO_4$ aq. 1:100.
14.	Potassium permanganate	$KMnO_4$ aq. 1:1000.
15.	Potassium permanganate	$KMnO_4$ gr. 1, aq. oz. 1.
16.	Silver nitrate	$AgNO_3$ aq. 1:16,000.
17.	Sodium thiosulphate	5% aq.
18.	Sodium thiosulphate	10% aq.
19.	Sodium thiosulphate	15% aq.
20.	Sodium salicylate	Sod. salicylate gr. 20, aq. oz. 1.
21.	Tannin-alcohol	Tannin gr. X, alcohol 40% oz. 1.
22.	Zinc sulphate, aq.	$ZnSO_4$ gr. 2, aq. oz. 1.
23.	Zinc sulphate, aq.	$ZnSO_4$ gr. 4, aq. oz. 1.
24.	Zinc sulphate, aq.	$ZnSO_4$ gr. 8, aq. oz. 1.
25.	Zinc sulphate-glycerine	$ZnSO_4$ gr. 2, glycerine oz. 1.

Woodward, Kingery and Williams [36] tested thirty-seven derivatives of phenol with regard to their fungicidal power. Phenol itself was used as a basis for comparison. Iodine and mercuric chloride were also tested. The test organisms were Monilia tropicalis, Cephalosporium and Sporotrichum. These organisms were selected, after preliminary tests, as being typical of a large group of pathogenic yeasts and molds. Part of these investigators' tabulations, showing some of the results of their tests with Monilia tropicalis, is reproduced as follows:

Compound	Effective Dilution	Phenol Coefficient
Phenol	1:75	1.0
Thymol	1:2,000	26.6
Iodine	1:20,000	266.0
Mercuric chloride	1:20,000	266.0

A further report on their study [37] showed that iodine surpasses all other drugs tested when used against water and broth suspensions. Its power to kill, however, is greatly reduced in the presence of proteins. The results of the tests of fungicidal activity under that condition are shown in the following tabulation, which accompanies their article:

COMPARATIVE STUDY

Organism: Monilia Tropicalis. Time: 15 Minutes.

Drug	Water Suspension (Effective Dilution)	Broth Suspension (Effective Dilution)	Hide Dust Suspension (Effective Dilution)	Vesicle Fluid Suspension (Effective Dilution)	Blood Serum Suspension (Effective Dilution)
Iodine	1:75,000	1:20,000	1:5,000	1:2,000	1:1,000
N-hexylresorcinol	1:20,000	1:15,000	1:5,000	1:2,000	1:2,000
Chlorothymol	1:9,000	1:8,000	None*	None	None
Thymol	1:2,000	1:2,000	1:1,250	None	None
Sodium hypochlorite	1:7,500	1:2,500	1:750	1:500	1:500
Salicylic acid	1:1,250	1:1,100	None	None	None
Benzoic acid	None*	None	None	None	None
Sodium thiosulphate	None	None*	None	None	None

* "None" indicates that even a saturated aqueous solution was not strong enough to kill the organisms.

The same article went on to state:

Of the four commonly used drugs, presumably salicylic acid and benzoic acid enjoy a popularity of greatest duration. Under the conditions imposed, salicylic acid appears to act only in high concentration in the presence of water and broth suspensions, and fails entirely even in saturated solution in the presence of the other three substances used. Even more striking is the complete inability of benzoic acid to kill in saturated solution under any of the conditions imposed by these experiments. The same is to be said of sodium thiosulphate. . . ."

36. Woodward, G. J.; Kingery, L. B., and Williams, R. J.: The Fungicidal Power of Phenol Derivatives: I. Effect of Introducing Alkyl Groups and Halogens, J. Lab. & Clin. Med. **19**:1216-1223 (Aug.) 1934.

37. Woodward, G. J.; Kingery, L. B., and Williams, R. J.: The Fungicidal Power of Phenol Derivatives: II. Strength in Presence of Proteins, J. Lab. & Clin. Med. **20**:950-953 (June) 1935.

Woodward and his co-workers concluded the report thus: "Higher phenols have been found worthy of further clinical study in the treatment of fungus diseases. . . . A drug more specific in its action than those now available is needed."

Levine [38] used phenylmercuric nitrate in the treatment of 205 patients with fungous and yeast infections of the skin. He concluded that it was highly efficacious in the treatment of these conditions, producing cures in cases in which other forms of treatment had failed.

Greaves,[39] after working with the same drug, reported its use in the treatment of 75 patients with otitis externa and 100 with fungous infections of the skin. He was unable to find fungi in any of the cases of otitis externa, by smear, hanging drop or culture, even though the symptom was itching within the canal and though excoriations and abrasions were present as a result of scratching with the finger nail or other objects. He used a solution of phenylmercuric nitrate, in a dilution of 1:1,250 in 95 per cent alcohol, daily for thirty minutes for three to four days or longer. This part of the treatment was followed by the use of a powdered phenylmercuric nitrate of 1:1,500 strength. His conclusions were (1) that in 75 cases of otitis externa it eliminated the pain and discomfort in cases of acute forms of the disease and shortened the course and hastened the recovery in the cases in which the condition was chronic and long standing, and (2) that in 100 cases of dermatophytosis it was efficient in rapidly and effectively eliminating fungi from the lesions.

Enlows [27] declared the following procedure (abstracted from her article) to be her most successful treatment:

> Irrigation is performed with warm physiologic solution of sodium chloride to remove debris, then gauze packs soaked with a saturated solution of aluminum acetate (N. F.) are inserted into the canal and allowed to remain twelve to eighteen hours. At the end of that time the canal is much less swollen and red. It is again irrigated and dried, and a 10 per cent solution of cocaine is instilled and allowed to remain twenty minutes. This is removed, the canal dried and Gram's iodine solution applied full strength. This course is to be followed by daily treatment thereafter for one week, after which the patient should be seen three times a week for two, three or more weeks. The daily treatment during the first week consists of the cleansing of the canal with hydrogen peroxide followed by the instillation of a thick paste of aluminum acetate. If there is a recurrence the Gram's iodine solution may be used as before, or the patient may use it at home, diluted five times. If iodine is not well tolerated the patient is instructed to use the 2 per cent aluminum acetate.

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38. Levine, B.: Use of Phenyl Mercuric Nitrate in Tinea and Yeast Infections of the Skin, J. A. M. A. **101**:2109-2111 (Dec. 30) 1933.

39. Greaves, F. C.: Phenyl Mercuric Nitrate in the Treatment of Otitis Externa and of Dermatophytosis, U. S. Nav. M. Bull. **24**:527-532 (Oct.) 1936.

In other cases cures were effected by Enlows by the use of silver nitrate, 25 per cent, followed by that of alcohol, 70 per cent.

W. D. Gill [10] expressed the opinion that the three essential points in the treatment of otomycosis are: (1) control of pain, (2) control of mycotic infection and (3) prevention of reinfection. Four objectives of treatment as outlined by King Gill [2] are:

> (1) To cleanse mechanically the external canal from the meatus to the drum head as carefully as possible, avoiding any trauma or maceration of the skin, (2) to reduce local inflammation and allay pain, (3) to limit sporulation and (4) to leave the parts in such a condition as to prevent recurrence.

King Gill was also the first to call attention to the fungicidal action of metacresyl acetate, known under the trade name of cresatin (Dr. N. Sulzberger). Since that time it has been used by many and ranks first in the list of fungicides.

Whalen [18] summarized the methods of others and reported the following to be his method of choice (the procedure as presented here is quoted directly from Whalen's article):

> The canal is first cleared of débris by irrigation and then dried by means of a blast of warm air. It is then packed with absorbent cotton saturated with cresatin. The patient is directed to remove this packing the following morning. After the packing has been removed an attendant places six drops of 1 per cent thymol in 70 per cent alcohol in the canal, the patient lying with the affected ear uppermost and remaining in this position for five minutes. This treatment with thymol drops is repeated twice a day for five days. . . . A thymoliodide powder is [then] prescribed to be blown into the canal twice a day for five days.

The use of this powder is to relieve the pruritus and to clear up the dermatitis. The local treatment is supplemented by the administration of potassium iodide orally. "The initial dose of 15 grains (1 Gm.) a day," Whalen stated, "is rapidly increased to 30 grains (2 Gm.) and is continued for thirty days." He also mentioned the aromatic oils, that is, oil of mustard, oil of cloves and oil of cinnamon, as being effective fungicides. Experimental work shows cresatin and thymol to be the top-ranking fungicides; so any treatment in which they are used would be the method of choice.

Searcy [40] also used thymol by mouth in 5 grain (0.32 Gm.) capsules at the ratio of 10 grains (0.65 Gm.) per 100 pounds (45.4 Kg.) of body weight, given with a glass of milk to assist in absorption. He used merthiolate and alcohol with thymol, thymol in cresatin diluted with olive oil and 1 per cent thymol added to 1 or 2 per cent iodine and boric acid powder.

Reinfection is easy, especially if the person goes swimming. To prevent reinfection, stated W. D. Gill,[10] "the ears should be dried afterward and 70 per cent ethyl alcohol instilled. . . ."

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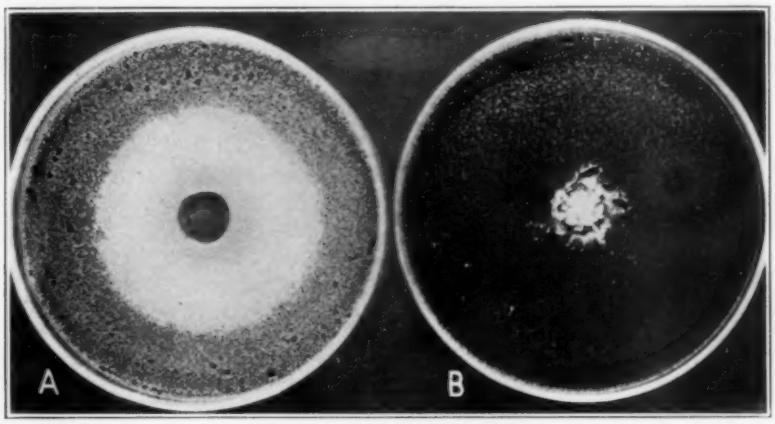
40. Searcy, H. B., in discussion on Gill.[10]

EXPERIMENTATION WITH SILVER PICRATE

Since silver picrate powder has proved of value in the control of protozoon and yeast infections, I wished to try it in the treatment of fungous infections in the ear. I used it on 8 patients. Two were cured by the treatment, which included frequent cleansing of the external canal. The other 6 patients did not respond to this method of therapy. The cleansing of the canals may account for the response.

The fungicidal action of silver picrate powder was also studied in the laboratory.

The agar cup plate method of determining the value of antispetics, as outlined by Allen and Wright,[35] was used. A ninety-six hour growth of A. niger in broth was mixed with some melted Sabouraud's medium and poured in a Petri dish. A



Agar cup plates used in testing the fungicidal action of silver picrate powder. Aspergillus niger was the fungus used. *A* shows the control dish, into the center of which 5 per cent solution of phenol was placed. *B* shows the dish into which silver picrate powder was placed. Inhibition of growth is clearly visible in *A;* the silver picrate powder produced no inhibition of the fungous growth.

sterile cork borer was used to remove a disk of the agar, making a cup in the center of the plate. Into this cup was placed the silver picrate powder. For a control, a 5 per cent solution of phenol was used in a similarly prepared plate.

The inhibition of the growth of the fungus by the phenol was taken as the standard. The distance from the edge of the cup to where the growth commenced was measured in millimeters.

The phenol inhibited the growth of A. niger for a distance of 1 cm. from the edge of the cup.

In the two plates in which silver picrate was used there was no inhibition of growth of A. niger at any time.

The following case reports have been summarized from my original paper in which the cases were recorded. In all cases the conditions

were diagnosed on the basis of culture of the fungi on Sabouraud's medium and on the basis of microscopic examination. The treatment of the disease in the majority of the cases was a modification of that described by Whalen,[18] as already outlined.

REPORT OF CASES

CASE 1.—*Monilia.*

J. B., a white man, aged 63 years, was first seen in November 1938 with a history of itching of the right ear associated with a purulent discharge for two years. Examination revealed a moist, dirty gray, foul-smelling mass filling the external canal. There was no improvement after four treatments consisting of cleansing followed by the use of silver picrate powder. Metacresyl acetate (cresatin) on a cotton wick was inserted in the external canal and allowed to remain for twenty-four hours. This treatment was followed by the use of 1 per cent thymol in 70 per cent alcohol twice a day for five days. This cured the patient, and no evidence of recurrence had appeared after several weeks.

CASE 2.—*Aspergillus niger.*

G. W., a white woman aged 27 years, was first seen in July 1938, complaining of marked itching of both ears, present for about three years. Recently there had been a sense of pressure and an impairment of hearing in both ears. This was found to be due to a large mass of moist, gray material with black dots on it, so often observed in A. niger infection. The patient had been unsuccessfully treated for this condition at various times since its onset. It was doubtless an unrecognized fungous infection. The condition did not respond to treatment with salicylic acid in alcohol or to half a dozen treatments of thorough cleansing and insufflation of silver picrate powder. It cleared up quickly when cresatin and thymol in alcohol were used. A check-up six weeks later revealed normal canals.

CASE 3.—*Penicillium.*

R. S., a white woman aged 69 years, was seen in June 1938 because of intense itching of the external canals for several months. There was a dry, scaly, crumbly, whitish material practically filling both canals. The past history is of interest in that the symptoms had been present for six years, and she had been treated at intervals without relief. At times there had been associated otitis media. After a two weeks' course of four treatments consisting of simple cleansing and the application of silver picrate powder, the symptoms were relieved and the canals normal; the condition remained normal after six weeks.

CASE 4.—*Monilia.*

M. B., a white man aged 47 years, was admitted to the clinic in October 1938, complaining of itching around the ears and in the canals for one year. The debris in the canals was of the dry type. The patient had been treated six months before for "eczema" of the ears with only temporary relief. No improvement resulted from treatment with silver picrate powder, but all symptoms and abnormal findings quickly cleared up when cresatin and thymol in alcohol and thymol iodide powder were used.

CASE 5.—*A. niger.*

L. C., a white woman aged 24 years, sought consultation on Sept. 9, 1938 because of (1) itching of both ears for ten years, more severe the past four years, keeping her awake at nights, and (2) an intermittent discharge from both ears for the past four years. The discharge was described as creamy and was said to have

recurred at frequent intervals without any apparent provocation. During this four year period the patient had received treatment from four physicians for a condition diagnosed to her as eczema of the ear canals. Hydrogen peroxide, ultraviolet irradiation applied to the canals and other therapeutic agents had been used. The last treatment had been for one month, six months before, but had given relief for only a short time. The canals contained a dry, scaly material. This patient was treated for a time with salicylic acid in alcohol and silver picrate powder without marked benefit. Metacresyl acetate (cresatin) and thymol in alcohol gave immediate relief. She was observed and treated with thymol iodide powder at intervals for a month and was clinically cured when discharged.

CASE 6.—*A. niger.*

G. B., a white woman aged 61 years, was seen on September 1938, complaining of pain and itching of the left ear for five days. The canal was filled with a gray, cheesy, semisolid material which gave a clinical impression of being due to a fungus. Four years previously the patient had been treated for chronic purulent otitis media of two years' standing. The ears stopped draining and had been dry until the present onset. Absence of the tympanic membrane was observed. This case illustrates fungous infection of the external canal associated with otitis media, clearing up when treated with silver picrate powder. There had been no recurrence two months later.

CASE 7.—*Aspergillus, Monilia, Penicillium.*

M. S., a man from India, aged 45 years, was seen in July 1938 at the request of the ophthalmic department. Routine questioning revealed that there had been itching of the right ear for two years but that the patient had not sought medical care for it. The right ear contained a large plug of dried cerumen, which was covered with a white growth suggesting a fungus. Inside the cerumen was found a piece of match stick about ½ inch (1.27 cm.) long. The patient did not know how long it had been there, but said that owing to the intense itching he had frequently used a match stick to scratch the canal. He was treated once with silver picrate powder, which relieved the itching, but evidence of fungous growth was observed in the ear in November, the next time the patient was seen. He did not return for further treatment. The condition in this case illustrates a multiple type of infection in one person.

CASE 8.—*No Report.*

K. H., a white woman aged 42 years, was first seen in December 1937 with a complaint of itching of the left external canal. There is no record of treatment. When she was seen again in July 1938, both ears were itching and there was a mass of scaly debris and dried skin which was suggestive of fungus. On Sabouraud's medium the growth was grossly typical of a fungus, but the type was not identified microscopically. The patient was treated twice by cleansing and the application of silver picrate powder. She did not return. The result of treatment is undetermined.

CASE 9.—*Aspergillus.*

S. R., a white girl aged 12 years, was admitted in April 1938 for treatment of a flare-up of chronic purulent otitis media in the left ear. The right canal was filled with a moist gray mass produced by the fungous infection. The middle ear was not involved at this time. There was constant itching of both ears. The patient was treated for a month with salicylic acid in alcohol without much success. Tincture of metaphen had produced marked improvement by the time of consultation one week later, but further follow-up was impossible.

CASE 10.—*Monilia.*

J. McK., a white girl aged 14 years, was seen in February 1938 because of itching of the ears and diminished hearing. The left external canal was filled with a moist, sour, cheesy material. The hearing was improved on the removal of this. The tympanic membranes were normal. The patient was seen four times during the next two months and treated by cleansing of the ears and instillation of tincture of metaphen; salicylic acid in alcohol was used twice daily at home. The condition gradually improved. Eight months later the patient was still free of symptoms, and there was no evidence of recurrence.

CASE 11.—*Monilia.*

M. S., a white girl aged 13 years, was seen in August 1938, complaining of intense itching of both ears of three months' duration. Both ears were filled with a dirty gray, moist, foul-smelling material, clinically of fungous origin. Some nonspecific treatment for the otitis externa was administered, and the use of salicylic acid in alcohol was producing some improvement when the patient was last seen, in October 1938.

CASE 12.—*Ringworm (probably due to Trichophyton).*

O. R., a white woman aged 47 years, was admitted for treatment of chronic purulent otitis media complicated by a fungous infection and further complicated by a secondary bacterial infection of the canal wall. There was an associated fungous infection of the hands, which was probably the primary source of infection. The patient was cured with compound ointment of benzoic acid N. F. (Whitfield's ointment), one-half strength, and salicylic acid in alcohol, both used in the ears.

CASE 13.—*Penicillium.*

W. G., a white man aged 30 years, was seen in October 1938. He gave a history of severe itching associated with a discharge from both ears. Previous treatment had given no relief. All positive findings were in the external canals only. The use of a wick saturated with metacresyl acetate (cresatin), placed in the canals and allowed to remain for twenty-four hours, followed by a few days' treatment with thymol in alcohol and thymol iodide powder, produced a rapid and complete recovery.

CASE 14.—*A. niger.*

J. B., a white girl aged 4 years, the youngest patient in the series, was seen because of diseased tonsils and adenoids. The child was found to have a severe fungous infection of the external canals. She was treated without success with tincture of metaphen, salicylic acid in alcohol and Sulzberger's powder (boric acid with iodine). She made a quick recovery when cresatin and thymol in alcohol were used.

CASE 15.—*A. niger.*

R. L., a white woman aged 20 years, was first seen in March 1938 because of a large, sessile exostosis of the external canal. This interfered with ventilation of the canal; medial to the obstruction a large amount of debris and cerumen with a sour odor was found. The patient was given salicylic acid in alcohol to use, but in November she reported no improvement. Both ears were now itching and felt stopped up. Treatment with cresatin, thymol in alcohol and thymol iodide powder was started. In three weeks there was no complaint, and the canals were free of debris. The mechanical obstruction of the canal made it more susceptible to infection.

CASE 16.—*Rhizopus.*

M. M., a white woman aged 47 years, sought consultation for a condition due to one of the more rare fungi found in the ears. She was cured by the use of salicylic acid in alcohol.

CASE 17.—*A. niger.*

B. R., a white woman aged 40 years, was seen in May 1938 because of acute purulent otitis media, bilateral, associated with a fungous infection. She was treated with a preparation of iodine and mercury, with boric acid in alcohol and with Sulzberger's powder (boric acid with iodine) for two months. In August both ears were dry and the canals normal.

CASE 18.—*Aspergillus.*

K. J., a white woman aged 23 years, had been troubled with discharging ears accompanied by itching for four years. The condition was otitis externa due to fungus. One treatment consisting of cleansing and the application of a 10 per cent solution of silver nitrate to the canals was given. The patient did not return.

CASE 19.—*Alternaria.*

R. K., a white woman aged 28 years, had been troubled for over two years with an itching and crust formation in both canals. She had been treated many times and with many methods without relief. When the condition was finally diagnosed and specific treatment instituted, the patient made rapid improvement but was not followed up long enough for a permanent cure to be proved.

CASE 20.—*A. niger.*

D. D., a white woman aged 41 years, was seen in January 1939 with the complaint of an intense itching of the external canals associated with a stopped up feeling of the ears, present for four years. The left canal contained white, moist debris with dark areas in it. Specific treatment consisting of the use of cresatin and thymol relieved the symptoms, and the canal was normal two weeks later.

CASE 21.—*A. niger.*

S. S., a white man aged 64 years, was first seen in October 1938 because of nerve deafness. At this time the canals were normal. Three months later there was itching of the canals associated with buzzing and ringing in the ears, severe enough to keep the patient awake. Both canals contained a moist, black mass, thought to be due to fungus. Specific treatment with cresatin and thymol produced immediate improvement, but the patient was not followed up long enough for the end result to be known.

CASE 22.—*Monilia.*

L. C., a white man aged 76 years, the oldest patient in the series, was seen because of a fungous growth in the ears which had produced some loss of hearing. Two weeks after treatment with cresatin and thymol was instituted, the hearing was improved and the canals were normal.

CASE 23.—*Monilia.*

J. C., a white man aged 28 years, had a fungous infection which was discovered during routine examination for tonsillectomy. The growth was of the dry type. It was not treated.

CASE 24.—*A. niger.*

H. C., a white woman aged 39 years, was seen in January 1939 complaining of recurrent attacks of earache, frontal headache, itching of the ears and diminution of hearing, of one month's duration. There had been similar attacks previously,

Data on Otomycosis Given in Case Reports

Case No.	Name of Patient	Age (Yr.), Sex	Fungus	Complications	Treatment	Result
1	J. B.	63 M	Monilia	None	Silver picrate powder on four occasions.....	No benefit
					Changed to cresatin and thymol in alcohol	Cured
2	G. W.	27 F	A. niger	None	Salicylic acid in alcohol for six weeks.....	Worse
					Silver picrate powder on five occasions in three months, no home treatment.....	No benefit
					Changed to cresatin and thymol in alcohol	Quickly cured
3	R. S.	69 F	Penicillium	Long standing; previously associated with chronic purulent otitis media	Silver picrate powder only.....	Cured
4	M. B.	47 M	Monilia	Nerve deafness	Silver picrate for three weeks.....	No benefit
					Cresatin and thymol in alcohol.....	Cured in 2 weeks
5	L. C.	24 F	Aspergillus	Long standing, ten years	Salicylic acid in alcohol.....	No benefit
					Silver picrate.....	No benefit
					Cresatin and thymol...	Quickly cured
6	G. B.	61 F	A. niger	Chronic otitis media with a perforated tympanic membrane	Silver picrate only.....	Quickly cured
7	M. S.	45 M	Aspergillus, Monilia, Penicillium	None	Silver picrate only.....	No benefit
8	K. H.	42 F	Not identified	None	Silver picrate powder...	No follow-up
9	S. R.	12 F	Aspergillus	Chronic otitis media; x-ray revealed chronic mastoiditis, bilateral	Salicylic acid in alcohol	Improved, but impossible to follow up
10	J. M.	14 F	Monilia	None	Tincture of metaphen in clinic; salicylic acid in alcohol.....	Cured after 6 mo. check-up
11	M. S.	13 F	Monilia	None	First treated for nonspecific otitis externa; salicylic acid in alcohol	Reported improved, but impossible to follow up after finding of fungus
12	O. R.	47 F	Ringworm fungus	Chronic otitis media, purulent	Salicylic acid in alcohol; Whitfield's ointment, one-half strength.....	Cured
13	W. G.	30 M	Penicillium	None	Cresatin; thymol in alcohol.....	Cured
14	J. B.	4 F	A. niger	None	Tincture of metaphen; salicylic acid in alcohol; iodine and boric acid powder.....	Still present 6 mo. later
					Changed to cresatin and thymol in alcohol.....	Cured in 2 wk.
15	R. L.	20 F	A. niger	Exostosis of external canal	Salicylic acid in alcohol	No relief
					Cresatin and thymol in alcohol.....	Cured
16	M. M.	47 F	Rhizopus	None	Salicylic acid in alcohol	Cured

Data on Otomycosis Given in Case Reports—Continued

Case No.	Name of Patient	Age (Yr.), Sex	Fungus	Complications	Treatment	Result
17	B. R.	40 F	A. niger	Acute otitis media, purulent	Merodicein; boric acid in alcohol; boric acid and iodine powder.....	Cured
18	R. J.	23 F	Aspergillus	None	Silver nitrate, 10%, once only.....	Did not return
19	R. K.	28 F	Alternaria	None	Cresatin; thymol in alcohol; thymol iodide....	Improved
20	D. D.	41 F	A. niger	Nerve deafness	Cresatin; thymol in alcohol; thymol iodide....	Improved
21	S. S.	64 M	A. niger	Nerve deafness	Cresatin; thymol in alcohol; thymol iodine....	Improved
22	L. C.	76 M	Monilia	Nerve deafness	Cresatin; thymol in alcohol.....	Improved
23	J. C.	28 M	Monilia	Perforated tympanic membranes, bilateral	None.....	None
24	H. C.	39 F	A. niger	None	Cresatin; thymol in alcohol; thymol iodide....	Cured
25	I. G.	47 M	A. niger	None	Cresatin; thymol in alcohol; thymol iodide....	Improved

which were associated with a discharge from the ears. The canals were found to be packed with a soft, yellowish white, cheesy debris. Cleansing of the ears did not reveal otitis media but did restore the hearing. One month after treatment with cresatin and thymol, all symptoms mentioned had been relieved and the canals were normal.

CASE 25.—*A. niger.*

I. G., a white man aged 47 years, presented a condition which was an example of the many undiagnosed fungous infections of the ears which had been unsuccessfully treated as nonspecific otitis externa but made rapid improvement when diagnosed and treated by specific methods. The complaints were itching of the ears associated with scaly debris which kept reforming and produced a buzzing in the ears.

SUMMARY OF DATA ON REPORTED CASES

The chief data on the reported cases, presented in the accompanying table, are summarized in the following tabulations:

Incidence of Types of Fungus

Total patients, 25

Fungus	No. of Patients
Aspergillus	13
Monilia	7
Penicillium	3
Trichophyton ?	1
Rhizopus	1
Alternaria	1
No report	1
Total fungi	27*

* One patient had more than 1 fungus.

Incidence with Regard to Sex

Sex	No. of Patients
Female	17
Male	8

Incidence with Regard to Age

Age (Yr.)	No. of Patients
1-10	1
11-20	4
21-30	6
31-40	2
41-50	7
51-60	0
61-70	4
71-80	1

Youngest patient, 4 yr.; oldest patient, 76 yr.

Treatment and Results

Treatment	Result	No. of Patients
Silver picrate powder	Relief of symptoms	2
	No relief	6
Salicylic acid in alcohol	Relief	3
	Questionable	1
	No relief	4
Cresatin and thymol in alcohol	Improvement	5
	Cure	8

I studied 30 additional patients in whom symptoms and findings suggested fungous infection but in whom cultures revealed no fungus.

CONCLUSIONS

1. Otomycosis occurs much more frequently than the textbooks would lead one to believe. It is frequently overlooked in the treatment of otitis externa.

2. Otomycosis has not always been treated properly. Recent experimental work has furnished better methods of treatment.

3. Powdered silver picrate is not effective in the treatment of otomycosis.

4. Metacresyl acetate (cresatin) and thymol have the greatest fungicidal activity of any drugs now available.

ELONGATED STYLOID PROCESS

A CAUSE OF OBSCURE THROAT SYMPTOMS

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DURHAM, N. C.

The purpose of this communication is to point out that the elongated styloid process is common and that it will often, if sought, be found to be the cause of obscure complaints involving the throat.

Forty-three patients having this condition were found in the private and dispensary services of Duke Hospital, 39 of them between January 1937 and September 1939. Only 11 of the 43 patients came to operation. Four of these patients had been previously reported on.[1]

According to Dwight,[2] the styloid process is derived from the second branchial arch and normally attains the length of 2.5 to 3 cm. (fig. 1). It extends from the under surface of the petrous portion of the temporal bone forward, downward and mesially. The tip is cartilaginous and in the abnormally long styloid process may fuse with the lesser horn of the hyoid bone in the form of a calcified stylohyoid ligament (fig. 2). Such a styloid process is an anatomic curiosity, but it may have clinical significance, as illustrated in case 1, in which a needle was broken off against it during the suturing in a tonsillar fossa (fig. 3). Many styloid processes that are elongated but still are not long enough to reach the hyoid bone are asymptomatic; but if they project abnormally forward and mesially into the tonsillar fossae they not only often give rise to symptoms but may interfere with tonsillectomy.

The symptoms consist of a sensation of fulness in the throat; dysphagia; pain in the throat aggravated by swallowing; dull ache or marked lightning and lancinating pain in the throat radiating to the ear and mastoid tip; a sensation described as neuralgic pain in the throat; pain and soreness in the hard and the soft palate, and a sensation of food having lodged in the throat, necessitating frequent swallowing. Occasionally symptoms are not evident until some days after tonsillectomy. For weeks or years the patient thinks the tonsillar fossa has failed to heal. These symptoms are sometimes indistinguishable from neuralgia of the glossopharyngeal nerve, which lies close to the styloid

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1. Eagle, W. W.: Elongated Styloid Processes: A Report of Two Cases, Arch. Otolaryng. **25**:548 (May) 1937.

2. Dwight, T.: Stylohyoid Ossification, Ann. Surg. **46**:721, 1907.

Fig. 1.—Two specimens of styloid processes of normal length.

Fig. 2.—An elongated styloid process that fuses with the lesser horn of the hyoid bone. The specimen was found in classroom dissection. The department of anatomy of Duke University gave permission for the specimen to be used in this study.

process.[3] A diagnosis of idiopathic glossopharyngeal neuralgia cannot be made until symptoms due to an elongated styloid process are eliminated by digital palpation of the tonsillar fossa and by lateral roentgenograms of the neck.

Diagnosis is established by digital palpation of the tonsillar fossae. The index finger is placed over the tonsil or in the tonsillar fossa, and the tip of the elongated styloid process is felt as a hard prominence beneath the finger tip. The type of styloid process that fuses with the hyoid bone and the type that is elongated but does not project into

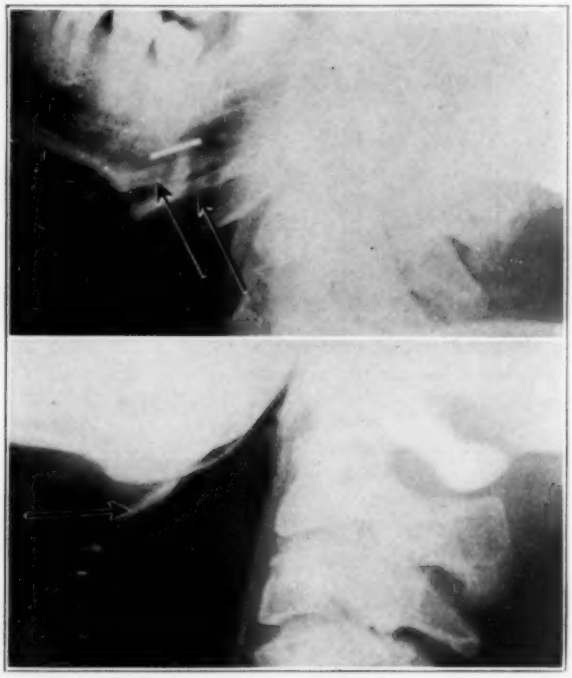

Fig. 3 (case 1).—Roentgenograms of elongated styloid processes that fused with the lesser horns of the hyoid bone. They were asymptomatic, and the condition was accidentally discovered when the suture needle broke during tonsillectomy. The fragment of the needle can be seen above and lateral to the left styloid process.

the tonsillar fossa may be mistaken on palpation for the mandible, but when the condition is suspected a roentgenogram is always final in establishing the diagnosis. The elongated styloid processes that project abnormally forward and mesially into the tonsillar fossae are always palpable and most often give symptoms, and roentgenograms are only confirmatory (figs. 4 and 5).

3. Harris, W.: Neuritis and Neuralgia, New York, Oxford University Press, 1926, chap. 16.

Fig. 4.—An elongated styloid process also found in anatomic dissection rooms (Dr. W. B. Anderson made the specimen available for this study).

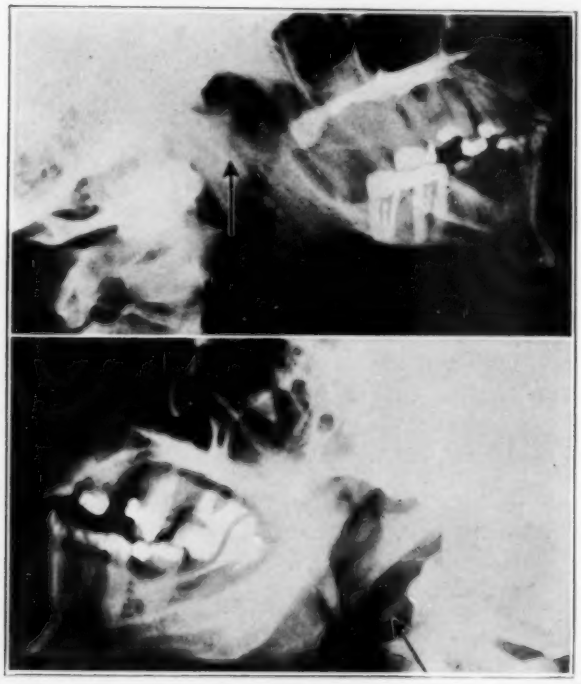

Fig. 5 (case 2).—Roentgenograms of elongated styloid processes that gave typical symptoms, which were relieved by amputation.

The treatment of the condition is entirely operative. Results obtained by fracturing the process laterally have not been satisfactory. The operative setup is similar to that for tonsillectomy. In our institution tonsillectomy is done entirely by dissection with the patient under light ether anesthesia. The Davis mouth gag and tongue blade are used to hold the mouth open and the tongue out of the operative field. Bleeding is controlled by no. 0 catgut sutures. Suction in addition to lowering of the head and elevation of the feet is used to prevent aspiration of blood. In a case in which the tonsil is superimposed over an elongated styloid process the tonsil is removed first. The tissues over the elongated styloid process are then stripped back, and the presenting tip of the process is amputated with a rongeur. In a case in which the tonsils have been previously removed a small incision is made over the tip of the elongated styloid process. The soft tissues are then bluntly dissected back from the tip, and amputation is done as far back on the shaft of the process as is deemed expedient, the proximity of the carotid artery and of the glossopharyngeal nerve being always kept in mind, as these structures might be injured. Bleeding is never troublesome; healing is prompt, and all patients so far operated on have had complete relief of symptoms.

REPORT OF CASES

The histories of 9 of the 11 patients who came to operation follow:

CASE 1.—A 30 year old white man was admitted to the hospital for a tonsillectomy at the recommendation of his physician, who believed that the tonsils were a focus of infection causing arthritis. During the operation, while the surgeon was suturing in the left tonsillar bed the needle point struck something hard and snapped in two. About two thirds of the needle was lost and not recovered after a search of two hours. A roentgenogram showed elongated styloid processes that fused with the lesser horns of the hyoid bone, and the needle fragment could be seen lying near the left process (fig. 3). The patient made an uneventful recovery from the operation and returned for removal of the needle fragment six months later. He has been well since.

CASE 2.—A 28 year old white woman was first seen in the laryngologic service of Duke Hospital eight years ago, because of pain over and in the left eye and in the region of the left frontal sinus, as well as transient earache, stiffness of the left temporomandibular joint, pain in the tip of the left mastoid process and pain in the left side of the pharynx. Tonsillectomy had been done twice, the last time two years before the first examination at Duke Hospital. The patient was found to have a deviation of the nasal septum to the left with a spur touching the lateral nasal wall at the posterior end of the left middle turbinate bone. Digital palpation of the tonsillar fossae was not done. When cocaine in a solution of 10 per cent was applied to the nasal mucosa in the region of the sphenopalatine ganglion on the left side there was immediate relief of the pain in the left eye and over the left frontal sinus. It was thought that the symptoms were due entirely to irritation of the left sphenopalatine ganglion by the septal spur. A submucous resection of the nasal septum, including the spur, was successfully done.

The patient was next seen six years later. She said that since recovery from the operation she had been free of pain in the left eye and over the left frontal sinus, but that she still had pain throughout the left side of the throat, soreness in the larynx and pain and tenderness in the tip of the left mastoid process and in the left ear. Examination at this time showed a Thornwaldt cyst in the nasopharynx and, on palpation of the tonsillar fossae, an elongated styloid process on the left. Pressure on the tip of the process by the examining finger caused accentuation of the symptoms described. Though the styloid process was not palpable on the right, a roentgenogram of the neck (fig. 2) showed both processes to be elongated. The one on the right was asymptomatic. At operation the Thornwaldt cyst was removed and 3 cm. of the left styloid process was amputated. The patient was completely relieved of symptoms when seen five months later and is still well.

This case well illustrates the importance of palpation of the tonsillar fossae in the presence of throat symptoms. Had that been done on the first examination the cause of the symptoms in the left side of the throat would also have been discovered. It is interesting to note that this patient has a sister and a brother, each of whom had elongated styloid processes. Each of these siblings had been seen by physicians because of throat symptoms similar to those of the patient of case 2. The cause was not discovered until that patient suggested to them the possible presence of an elongated styloid process. Such a process was found to be present. The brother was operated on and secured complete relief of his symptoms. The sister has not come to operation.

Case 3.—A 29 year old white woman was first seen seven years ago because of severe and persistent pain in the right side of the throat. Tonsillectomy had been done eight years previous in an unsuccessful attempt to relieve the pain. Examination of the throat without palpation of the tonsillar fossae revealed lymphoid hyperplasia at the base of the tongue, and it was thought that this condition was responsible for the symptoms. Accordingly, the lymphoid tissue was treated with roentgen rays. Although the lymphoid hyperplasia subsided, the pain in the right side of the throat persisted. Six years later the patient returned branded as "neurotic" by the referring physician. Meanwhile, my associates and I had learned the importance of palpation of the tonsillar fossae, and on the patient's return we found an elongated styloid process projecting into each tonsillar fossa. Though both processes were elongated and palpable, only the right one was amputated, and the patient was completely relieved of her symptoms.

Case 4.—A 47 year old white woman came for examination because of a dull, aching sensation in the left side of the throat and symptoms of fulness and choking of many years' duration. A tonsillectomy had been done elsewhere two years previously in an unsuccessful attempt to relieve these symptoms. In addition, the patient complained of postnasal discharge that caused her constantly to clear her throat. Examination disclosed a left antrum that failed to transilluminate and a mucopurulent discharge in the left naris. In addition, palpation revealed an elongated styloid process on the left side. A Caldwell-Luc operation was performed to clear up the infection of the left maxillary sinus. When the patient had recovered from this operation and was relieved of the postnasal discharge, she returned for amputation of 2.5 cm. of the left styloid process. She has been completely relieved of the throat symptoms.

CASE 5.—A 45 year old white woman had a constant dull, nagging pain in the right side of her throat as well as recurrent tonsillitis. Examination showed chronically diseased tonsils. Palpation of the tonsillar fossae revealed an elongated styloid process on the right side, the tip of which was easily palpable beneath the tonsil. A roentgenogram showed an elongated styloid process on each side. Since the styloid process on the left side was asymptomatic, only the right styloid process was shortened. The patient was completely relieved of her symptoms.

CASE 6.—A 41 year old woman sought consultation because of fulness and soreness of the throat together with dysphagia. Tonsillectomy with the region under local anesthesia and a submucous resection of the nasal septum had been done many years previously. Examination showed infectional hypertrophy of the adenoids and elongated styloid processes that projected markedly toward the midline. A roentgenogram confirmed this finding, and at operation about 4 cm. of each styloid process was removed. The patient was completely relieved of her symptoms when seen one year after operation.

CASE 7.—A 29 year old white man came to the hospital saying that his throat had never healed after tonsillectomy, which had been done fifteen months previously. His throat felt raw, and he had difficulty in swallowing. Palpation of the tonsillar fossae disclosed an elongated styloid process on the right. A roentgenogram showed both styloid processes to be elongated, but the right one was longer than the left. Two and five-tenths centimeters of the right styloid process was removed at operation. When the patient was seen several months later he said that the rawness and dysphagia had disappeared but that the right side of the throat seemed tight. Examination failed to reveal the cause, but it was assumed it was due to the formation of excessive scar tissue.

CASE 8.—A 62 year old white woman complained of pain in the right side of the throat of four years' duration. The pain was constant and was aggravated by swallowing. It occasionally radiated to the right ear and mastoid tip. There was a constant dull ache in the right side of the pharynx. Examination revealed chronic tonsillitis and an elongated styloid process beneath the right tonsil. A roentgenogram showed both styloid processes to be abnormally long. A tonsillectomy and adenoidectomy was done, and 2.5 cm. of the right styloid process was amputated. The patient was relieved of her symptoms.

CASE 9.—A 40 year old white woman was referred to the laryngologic service by the medical department because of a constant sore throat since a tonsillectomy in 1918. Palpation of the tonsillar fossae showed a prominent and elongated styloid process on the left, while that on the right was barely palpable. A roentgenogram revealed that both processes were elongated. At operation 5 cm. of the left styloid process only was amputated. The right styloid process was asymptomatic. When the patient was seen several months later, her throat was healed and she was relieved of her symptoms.

CASES 10 AND 11.—These cases have been reported previously.[1]

ANALYSIS OF CASES

In addition to the 11 patients who were operated on there were 32 who, for one reason or another, never came to operation. Some of these patients had had tonsillectomies, and some had not. Of these 32 patients,

16, or 50 per cent, had no symptoms, and their elongated styloid processes were discovered only because of routine palpation of the tonsillar fossae for elongated styloid processes when there were symptoms referable to the throat. The remaining 16 patients who did not come to operation complained of the aforementioned symptoms in varying combinations.

Of the 11 patients who came to operation 3 were male and 8 female. The ages ranged from 30 to 62. Tonsillectomies had been done on 8 patients, and on 3 no operation had been done. In 5 patients the condition was on the left side, in 3 it was on the right and in 2 it was bilateral. One patient was noticed because a needle had broken off during tonsillectomy against an elongated styloid process that was asymptomatic. Amputation of one or both processes during tonsillectomy and adenoidectomy was done on 3 of these patients.

Of the 16 patients who had symptoms and never came to operation, 6 were male and 10 female. The ages ranged from 22 to 71. Twelve had had tonsillectomies and 4 had not. The condition was on the left in 5 patients, on the right in 4 and bilaterally in 7.

Of the 16 patients with asymptomatic elongation of the styloid process, 4 were male and 12 were female. Their ages ranged from 30 to 78. All 16 patients had had tonsillectomies. The condition was found on the left side in 3 patients, on the right side in 7 and on both sides in 6.

One is impressed by the preponderance of the condition in the female sex as compared with the male.

SUMMARY

The importance of symptoms caused by elongated styloid processes is recognized.

The structure and the development of the condition, as well as the diagnosis and treatment, are discussed.

Forty-three patients having this condition are reported on.

The histories of 9 of the 11 patients who came to operation are presented and discussed.

The cases of 32 patients who did not come to operation are analyzed.

Elongated styloid processes were found in 3 members of a single family, 2 sisters and 1 brother (case 2).

PYOGENIC GRANULOMA OF THE NASAL FOSSA

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AND
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This study is based on the examination of so-called bleeding polyps of the nasal fossa in an effort to determine whether they are nonspecific edematous polyps associated with dilatation of the vessels and secondary hemorrhage, or fibroangiomas, or whether they may be classified as pyogenic granulomas.

As far as the literature is concerned, no general agreement has been reached as to the nature of the so-called bleeding polyps of the nasal fossa. The principal point of dissension is whether they are benign fibrovascular tumors or inflammatory masses.[1] Most of the investigators have favored the neoplastic theory; yet there are on record numerous instances of bleeding polyps of the nasal fossa diagnosed histologically as granulomas, as simple, nonspecific inflammatory masses or as granulation tissue. However, in 1936, Simonetta and Tavani [2] were the first to show the similarity of the bleeding polyp of the nasal fossa to the pseudobotryomycoma, a synonym for granuloma pyogenicum.

In the 5 cases here presented the lesions were clinically typical of bleeding polyps of the nasal fossa and were regarded as fibrovascular tumors. Careful microscopic analysis, however, led us to believe that these lesions revealed the histologic characteristics usually seen in cases of so-called granuloma pyogenicum.

REPORT OF CASES

CASE 1.—A 16 year old boy complained of severe attacks of nosebleed occurring over a period of several days. A dark red polyp which bled on the slightest contact was seen arising from Kiesselbach's area. Further otolaryngologic and general physical examination gave negative results. The growth was removed

This study was aided by a grant from the Otto Baer Fund.

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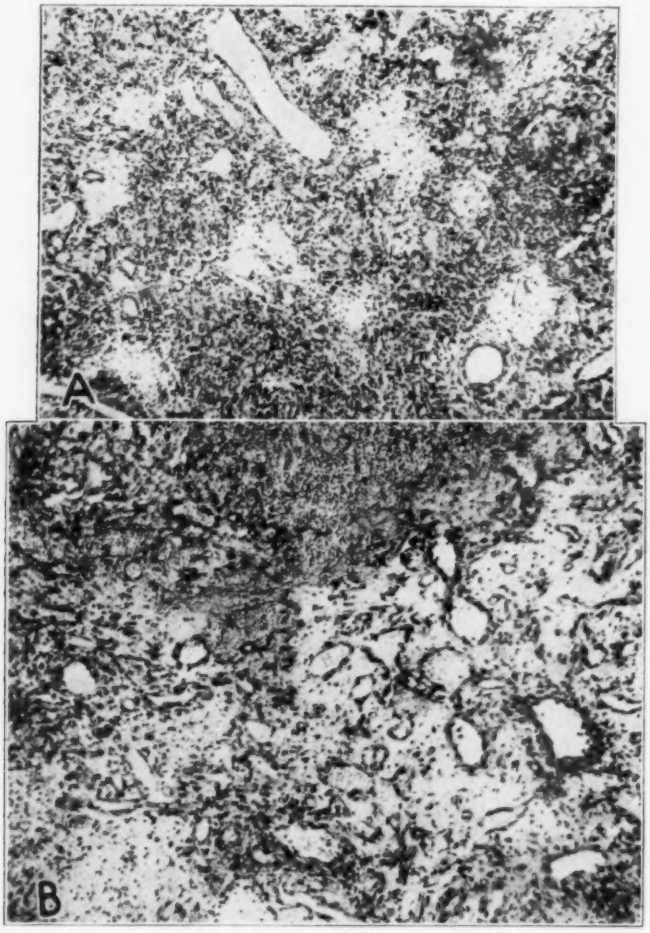
1. Schreyer, W.: Der blutende Septumpolyp, Ztschr. f. Hals-, Nasen- u. Ohrenh. **16**:41, 1926.

2. Simonetta, B., and Tavani, E.: Sur les rapports entre les "polypes saignants des fosses nasales" et les pseudo-botryo-mycomes, Rev. de laryng. **57**:293, 1936.

by cold snare. A small excrescence which developed on the site of the resected polyp disappeared after a course of radium therapy.

Histologic Examination.—Microscopic sections of the polyp revealed a structure composed of young connective tissue circumscribed by a layer of stratified squamous epithelium. The latter, in several areas, was interrupted and replaced by fibrin



Granuloma pyogenicum of the nasal fossa. *A*, case 4. Note the dilated blood spaces and the numerous polymorphonuclear leukocytes. Hematoxylin-eosin stain; × 44. *B*, case 5. Hematoxylin-eosin stain; × 68.

and polymorphonucluear leukocytes. Embedded in the body of the structure within the connective tissue were numerous large and small vascular spaces with endothelial lining as well as many tiny capillaries typical of those seen in granulation tissue. Polymorphonuclear leukocytes were scattered diffusely throughout the sections.

Case 2.—A boy aged 9 years had had severe attacks of nosebleed for one week. A polypoid structure, about 1.8 cm. in its greatest dimension, was noted on the anterior portion of the left side of the septum. This was resected by the cold snare and the tumor site cauterized with a 20 per cent solution of silver nitrate.

Histologic Examination.—The striking feature of the histologic sections was the presence of many large and irregular blood spaces with endothelial lining and with papillary projections of the stroma in the lumens. Some of these spaces were engorged with red blood cells, and others were empty. Elsewhere in the sections were numerous small capillaries typical of granulation tissue. The connective tissue, which was moderately cellular, revealed myxomatous changes and hyaline degeneration. Much interstitial hemorrhage was present, and the tissue was infiltrated with polymorphonuclear leukocytes and mononuclear cells, more densely in the periphery than in the center.

Case 3.—A woman aged 25 had suffered from repeated attacks of nosebleed. A dark red, easily bleeding polyp attached to the inner surface of the right ala nasi was removed by cold snare.

Histologic Examination.—The polyp showed a broad, intact, squamous cell border, with deep projections into the underlying tissue. The connective tissue element, hyalinized in some areas, was predominant. It contained numerous young connective tissue cells, extravasated red blood cells and endothelial lining cells. There were many tiny capillaries as well as arterioles. Polymorphonuclear leukocytes were observed in the superficial parts of the polyp.

Case 4.—A 35 year old man complained of stuffiness and inabilty to breathe through the left nostril, from which exuded a serosanguineous discharge. Examination showed a dark pink, moderately firm polyp attached to the anterior portion of the left side of the septum. This growth was resected.

Histologic Examination.—Microscopic study of the polyp revealed vascular spaces of various sizes and shapes. The intervening connective tissue was focally edematous. Polymorphonuclear leukocytes and mononuclear cells were present, particularly in the periphery of the structure. In large areas the surrounding squamous epithelium was absent, and in its place was fibrin with inflammatory cells.

Case 5.—A man presented a dark red polyp, which bled frequently and copiously, on the mucocutaneous junction of the left nostril in the region of the septum. The structure was removed.

Histologic Examination.—No epithelial layer was evident. The outer stratum consisted of a layer of fibrin with inflammatory cells in its meshes. Numerous medium-sized and small vascular spaces were observed. The intervening connective tissue was somewhat edematous and contained relatively few fibrocytes. Mononuclear cells and polymorphonuclear leukocytes were observed throughout the section.

COMMENT

The prominent inflammatory features of these polyps in the presence of extensive vascularity brings to mind the granuloma pyogenicum, a structure well known to the dermatologist. According to Wile,[3] granuloma pyogenicum is a tumor composed of simple hypertrophic circum-

3. Wile, U. J.: Granuloma Pyogenicum, J. Cutan. Dis. **28**:663, 1910.

scribed granulation tissue. Polyps of this type, which are sessile or pedunculated, occur most frequently on the hands (especially about the nails), on the face and lips and in the mouth.[4] They vary from about 0.3 to 2 cm. in greatest dimension and are observed with equal frequency in both sexes and in all age groups. Wile [3] stated:

> Clinically the cases [of granuloma pyogenicum] are characterized by rapidly growing lesions, starting definitely in some instances with an injury; at times painful, as often not so, . . . there is marked tendency to recurrence after removal, provided cauterization of the base has not been done. Superficial ulceration occurs in about half the number of cases and where present gives rise to frequent and easily induced hemorrhage. Histologically, too, there is a great uniformity in the findings. In all cases the tumor is one primarily of young connective tissue; in all the presence of blood vessels in greater or less numbers is noticeable. . . . Leucocytic infiltration of the mononuclear and polynuclear variety was present to a greater or less extent in all cases, the latter depending certainly to a degree at least on the presence of superficial ulceration and subsequent infection.

Thus the marked resemblance between the nasal polyps already described (as well as the bleeding polyps of the nasal fossa described in the literature [5]) and the granuloma pyogenicum is evident.

The clinical similarity of these lesions is striking. The growth of lesions of both types is rapid and often painless. Hemorrhage is a usual symptom; bleeding occurs on the slightest contact. Purulent discharge is frequent with both types, and recurrence after removal is likewise a factor common to both. Lesions of both types vary from approximately 0.3 to 2 cm. in diameter. They are bright red, blue-red or brownish red. Both are frequently eroded and may be sessile or pedunculated.

The incidence of bleeding polyps of the nasal fossa resembles that of granuloma pyogenicum. Either may occur in all age groups. It has been stated that bleeding polyps of the nasal fossa have a predilection for females.[6] However, in a series of cases of these polyps chosen at random from the literature, the division was approximately equal between the sexes.

Michelson [7] found a history of minor injury, such as pinprick, in 15 of 29 cases of granuloma pyogenicum of the skin and mouth. It

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4. Montgomery, D. W., and Culver, G. D.: Granuloma Pyogenicum, Arch. Dermat. & Syph. **26**:131 (July) 1932.

5. Pegler, L. H.: The Pathloogy, Affinities, and Treatment of So-Called Bleeding Polypus (Discrete Angeioma) of the Septum, Lancet **2**:1455 and 1537, 1905.

6. Banssillon, M., and Mounier-Kuhn, P.: Sur une forme des épistaxis de la grossesse: Les polypes saignants de la cloison, Bull. Soc. d'obst. et de gynéc. **25**: 71, 1936.

7. Michelson, H. E.: Granuloma Pyogenicum: Clinical and Histological Review of Twenty-Nine Cases, Arch. Dermat. & Syph. **12**:492 (Oct.) 1925.

seems reasonable to believe that trauma might be a factor in the pathogenesis of bleeding polyps of the nasal fossa, particularly in view of the usual location of these polyps in the exposed area of the nose known as Kiesselbach's triangle or the locus of Valsalva. Moreover, it is known that granuloma pyogenicum is radiosensitive.[4] In case 1 of this study the lesion was similarly radiosensitive.

Pyogenic granulomas have been observed in the mucous membrane of the mouth as well as on the skin.[4] In view of their location on the mucous membrane of the mouth, it is probable that pyogenic granulomas may also appear in as closely related tissue as the mucous membrane of the nose. Yet when they occur here they have been classified as bleeding polyps of the nasal fossa.

It may be of interest to mention that a granuloma pyogenicum of the larynx was recently observed in this laboratory.

Histologically the lesions in all 5 cases just reported were identical with bleeding polyps of the nasal fossa reported in the literature (most of which were diagnosed as nasal fibrovascular tumors), as well as with pyogenic granulomas reported in the literature. The granuloma pyogenicum is a structure usually bordered by a layer of epithelium, superficially ulcerated in about one-half the cases. It consists of young connective tissue and young blood vessels. The blood vessels may be so large and numerous as to suggest an angioma. The inflammatory reaction, which consists of infiltration of polymorphonuclear leukocytes and mononuclears, is not invariably present. Michelson [7] stated:

> It [the infiltration] is most marked in the upper third of the tumor, especially in eroded lesions. In lesions in which the epithelium is intact, even though thinned, there is often almost complete absence of infiltrate. . . . In certain specimens, there is a line of demarcation between the infiltrative and angiomatous portions of the tumor.

Therefore, bleeding polyps should not be classified as fibrovascular tumors even though their blood vessels present an angiomatous appearance and they do not show diffuse inflammatory infiltration. Apparently, they are pyogenic granulomas.

Cavazzani [8] presented 2 cases of grossly typical bleeding polyps of the nasal fossa which revealed malignant changes on histologic examination. He stated the belief that these malignant changes prove the neoplastic nature of so-called bleeding polyps of the nasal fossa and disprove their relation to pseudobotryomycosis, or granuloma pyogenicum, which Simonetta and Tavani said existed. However, it seems clear that this concept does not hold, since a malignant tumor may arise in a granuloma just as readily as in a benign tumor.

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8. Cavazzani, F.: Sui tumori del naso di origine vascolare, Oto-rino-laring. ital. **8**:69, 1938.

In view of all that has just been said, it is recommended that the term "bleeding polyp of the nasal fossa" should be discarded. It is inexact and categorical and refers merely to a symptom rather than to the type of underlying lesion. The evidence discussed in this study makes it seem probable that many an easily bleeding, painless, rapidly growing polyp of the nasal fossa, composed of young connective tissue and blood vessels, with or without infiltration of inflammatory cells, is a pyogenic granuloma.

SUMMARY

Five cases of bleeding nasal structures diagnosed as granuloma pyogenicum are presented. The identity of bleeding polyps of the nasal fossa with granuloma pyogenicum is shown by comparison of clinical and histologic characteristics of these lesions.

TREATMENT OF CHRONIC HYPERTROPHIC LARYNGITIS

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AND
LOUIS H. CLERF, M.D.
PHILADELPHIA

Chronic hypertrophic laryngitis occurs often as a result of abuse or misuse of the larynx. Constant trauma, especially in the presence of infection, produces permanent changes in the tissues. The result of this process may take the form of a localized area of inflammation or involvement of the entire membranous cord. In 1934, Loré [1] called attention to the latter type of hypertrophic laryngitis. In addition to observations made in experimental work on animals, he recorded the results obtained in 4 patients by stripping off the mucous membrane of the hypertrophic vocal cord.

The etiologic factor would seem to be trauma to the cords by habitual misuse of the larynx, by repeated acute infection or by a combination of these. In our series of 8 cases one or both of these conditions were present. Three patients worked in a noisy environment in which it was necessary for them to shout in order to be heard. Acute laryngitis combined with abuse of the larynx by constant talking was accountable in 4 cases. Repeated attacks of acute inflammation over a period of years were the responsible factor in 1 case.

By mirror laryngoscopy one observes marked thickening of one or both cords throughout the membranous portion. The posterior cartilaginous portion beginning at the tip of the vocal process of the arytenoid is generally not affected. No interference with motility of the arytenoids can be discerned. The normal pinkish white cord is replaced by a somewhat fusiform, irregular, reddish band which at times appears edematous. If the process is bilateral, the hypertrophic cords commonly are in apposition anteriorly, so that the anterior third of the airway is obliterated (fig. 1). Narrowing of the laryngeal airway sufficient to cause obstructive symptoms seldom occurs. Inflammatory changes may involve the ventricular bands, particularly in their anterior portions.

From the Department of Laryngology and Bronchology, Jefferson Hospital.

1. Loré, J. M.: (*a*) Stripping of the Vocal Cords, Laryngoscope **44**:803 (Oct.) 1934; (*b*) Preliminary Report on an Operation for the Relief of Double Abductor Paralysis, ibid. **46**:380 (May) 1936; (*c*) Suggested Operative Procedure for Relief of Stenosis in a Double Abductor Paralysis, Ann. Otol., Rhin. & Laryng. **45**:679 (Sept.) 1939.

Generalized laryngeal inflammation, with or without tenacious secretions, is a frequent accompaniment. On phonation, the edematous mucosa acts as a damper on the vibratory motion of the cords and is responsible for the marked dysphonia.

The histologic structure reveals that the chief changes occur beneath the epithelium. The squamous epithelium of the vocal cord becomes thickened with, usually, a layer of keratin on the surface. In the submucosa, edema and fibrosis are striking; associated with this characteristic is an infiltration of chronic inflammatory cells with increased vascularity at times. The tissue beneath the epithelium is increased to two to three times the normal size and is responsible for the thickened appearance of the cord. These changes extend down to the muscle without infiltrating this layer (fig. 2).

Fig. 1.—Drawing of indirect laryngoscopic view of the larynx in a patient with chronic hypertrophic laryngitis. The hyperplastic and edematous changes involve the entire membranous portion of both vocal cords.

Because of the pathologic alterations, treatment must necessarily be directed toward surgical elimination of the diseased tissue. This procedure is usually limited to restoration of the vocal cords to insure better phonation. If the ventricular bands are also involved no surgical intervention is attempted on these unless they are producing voice disturbances by altering function of the cord. Local medication would have no appreciable effect on the hyperplasia; its only accomplishment would be reduction of inflammation. Regeneration of the cord after removal of the mucous membrane occurs within a short time. Loré has demonstrated that the histologic structure of the new cord is almost identical with that of a normal one.

All operative work can be carried out by direct laryngoscopic manipulation with the area under local anesthesia. Pontocaine hydrochloride (1 per cent) and larocaine hydrochloride (2 per cent) applied

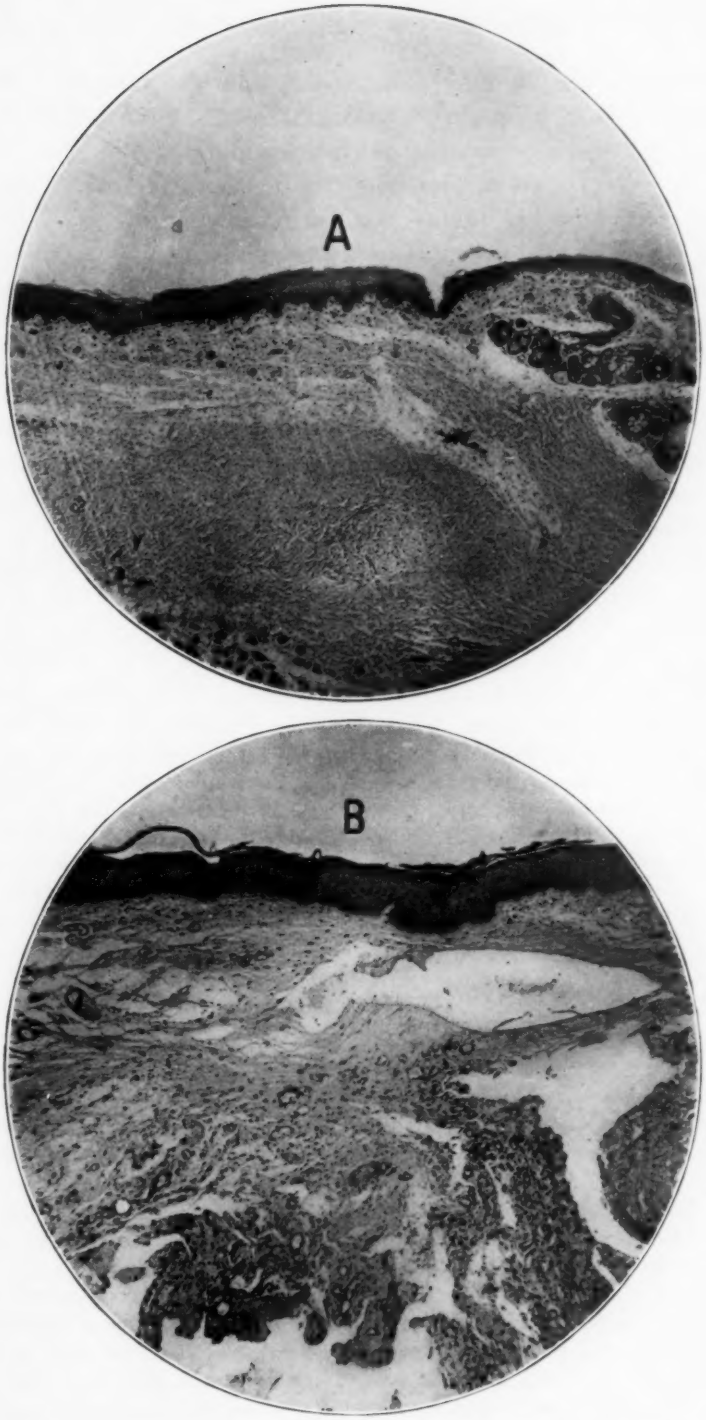

Fig. 2.—Photomicrographs (× 50) (*A*) of normal vocal cord and (*B*) of hyperplastic vocal cord. In *B* the epithelium is thickened, and edema and fibrosis together with infiltration of chronic inflammatory cells appear in the stroma.

to the larynx secure sufficient relaxation and also completely abolish the cough reflex. Removal of the redundant tissue can best be accomplished by the use of straight and bent cupped forceps. The mucous membrane is grasped and traction exerted along the longitudinal axis of the cord; stripping results in a fairly smooth surface. When the tissue is tough and resistant a useful procedure is to cut through the surface with cutting edge or tissue forceps, which allows the mucous membrane to be removed more readily. Both vocal cords can be stripped at the same sitting provided the anterior commissure is not disturbed. The formation of a web must be guarded against, and if there is any question of injury to the anterior commissure only one cord should be stripped at a time. Postoperative vocal rest is maintained for seven to ten days to allow healing and disappearance of exudation before the beginning of motion.

The following case reports will serve to illustrate the findings in chronic hypertrophic laryngitis, with either unilateral or bilateral involvement.

REPORT OF CASES

CASE 1.—A ship fitter 50 years of age, was admitted to the hospital complaining of hoarseness for eight years. The patient found it necessary to employ his voice constantly in a noisy environment and, in addition, smoked excessively and used alcohol in moderation. His continued shouting produced huskiness, which later developed into definite hoarseness. Mirror laryngoscopy disclosed generalized inflammation. The left vocal cord was edematous, and there was marked mucosal redundancy along its free margin; the middle portion of the right cord was replaced by a sessile, boggy lesion. Direct laryngoscopic exposure with the area under local anesthesia made it possible to strip the mucous membrane from the entire left cord and from the involved portion of the right. The histologic report of the tissue removed was that the condition was a chronic inflammatory lesion of the larynx. Considerable reaction and exudation resulted, but after these had subsided the edges of the vocal cords were straight and the voice was restored.

CASE 2.—A 42 year old housewife was referred to the bronchoscopic clinic because of persistent hoarseness for the past year. At the onset of the voice disturbance the patient contracted an acute infection of the upper respiratory tract. After this had abated an irritative cough and hoarsness appeared; repeated infections aggravated these symptoms. Alcohol and tobacco were used in excess. Studies of the lungs and blood gave negative results. Mirror examination revealed that the entire membranous portion of the left vocal cord was swollen, and its inner edge presented a somewhat edematous appearance. The right vocal cord appeared normal except for chronic congestive changes. The motility was normal, and no ulceration was observed. The mucosa of the left cord was stripped off under direct laryngoscopic visualization; local anesthesia was used. The lesion was diagnosed histologically as a fibroangioma. Vocal rest was advised for a week. After vocalization was resumed the voice steadily improved, and the examination demonstrated a thickened cord with a straight edge.

The following table indicates the essential features of this group of cases. Only patients with diffuse involvement of the entire membranous cord are included.

Data on Eight Patients with Chronic Hypertrophic Laryngitis

Case	Sex	Age (Yr.)	Duration	Site of Lesion	Method of Treatment	Result
1	M	50	8 yr.	Both cords	Stripping of mucous membrane	Cord edges straight; voice normal
2	F	42	1 yr.	Left cord	Stripping of mucous membrane	Cord slightly thickened; edge straight; voice slightly husky
3	M	40	1 yr.	Right cord	Removal of redundant mucous membrane	Slight irregularity of cord edges but voice satisfactory
4	M	63	5 yr.	Both cords	Removal of redundant mucous membrane	Cord edges straight; voice improved
5	F	48	7 yr.	Right cord	Incision and stripping off of mucous membrane	Some congestion of right cord; voice normal
6	M	37	6 wk.	Both cords	Right cord stripped first; left cord stripped after one month	Cord edges straight but somewhat thickened; voice normal
7	M	50	6 mo.	Both cords	Incision and stripping of mucous membrane	Left cord still thickened; voice improved
8	M	41	2 yr.	Both cords	Stripping of one cord followed later by same procedure on opposite side	Thickened right cord; voice improved

SUMMARY

Surgical stripping of the mucosa of the vocal cords secured satisfactory anatomic and functional results in 8 cases of chronic hypertrophic laryngitis. Although the group of cases was not large, this condition is infrequent. The pathologic changes in this disease are hypertrophy and hyperplasia, and surgical extirpation must be performed to effect a cure. Stripping of the cordal mucous membrane in cases of hypertrophic laryngitis associated with diffuse edematous involvement of the entire membranous cord seems the best method of bringing about restoration of the voice and return of cord function.

THE CANINE FOSSA

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The canine fossa constitutes the chief part of the anterior, or facial, surface of the maxilla. It extends from the infraorbital margin above to the alveolar process below, and horizontally from the zygomatico-maxillary suture to the anterior nasal aperture.

From a study of 200 skulls and many wet specimens it is found that there is a great variation in its construction, an understanding of which will aid greatly in the performance of certain surgical procedures which involve this area, particularly the Caldwell-Luc and the Denker operation.

STRUCTURE

The distance from the alveolar process above the second bicuspid tooth to the infraorbital margin was found to range between 30 and 49 mm., the average being 39.2 mm. (fig. 1). With the loss of teeth there are absorption of the alveolar process and a recession of the floor of the antrum reducing the height of the front wall until there is left little room for a surgical procedure. In one specimen, in which the change had occurred gradually over a period of more than fifty years, this height had been reduced to 14 mm. without the floor of the sinus being exposed. It is interesting to note that the height of this surface at birth is about 12 mm.

The lateral boundary is marked by the suture between the maxillary and the malar bone, which is approximately in a vertical plane continued downward from the lateral orbital margin. The sinus may extend beyond this suture, being limited laterally by the limit of the malar bone. Mesially the anterior wall extends to the nasoantral wall, at the junction of which there is formed the Y described by Ennis and Batson.[1] This angle may be completely pneumatized, in the event of which the sinus

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From the Department of Anatomy of the University of Southern California School of Medicine, with additional material from the Santa Barbara Museum of Natural History.

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Mr. A. B. Streedain prepared the illustrations, and the contributions of the Research Study Club of Los Angeles to the Anatomy Research Fund aided in this study.

1. Ennis, L. M., and Batson, O.: Variations of the Maxillary Sinus as Seen in the Roentgenogram, J. Am. Dent. A. **23**:201 (Feb.) 1936.

is brought to the forward limit of the nasal aperture; in such a case the Denker operation could easily be accomplished. On the other hand, the junction of these two walls may be as much as 20 mm. from the anterior border of the piriform space, all of which would have to be removed in the Denker procedure. It should also be noted that in such

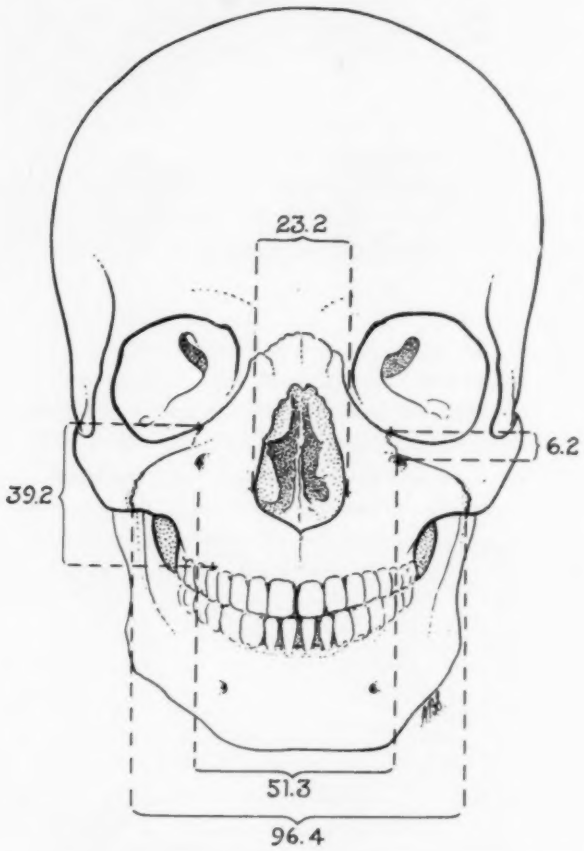

Fig. 1.—Front view of a skull, showing various measurements (in millimeters) pertaining to the canine fossa, based on 170 adult specimens: widest part of the anterior nasal aperture, 23.2 mm.; between the infraorbital foramens, from center to center, 51.3 mm.; from the infraorbital margin to the upper margin of the infraorbital foramen, 6.2 mm.; greatest width of the maxilla at the zygomaticomaxillary suture, 96.4 mm., and from the infraorbital margin to the alveolar process at the second bicuspid tooth, 39.2 mm.

an instance a trocar passed through the inferior meatus might miss the antrum entirely and enter the soft tissues in the canine fossa.

The infraorbital foramen is situated at the junction of the middle and inner one third of the infraorbital margin in a horizontal plane

which is often on a level with the anterior attachment of the inferior turbinate. In other words, a line drawn between the point of attachment of the inferior turbinate bones extended laterally will in many instances be on a level with the infraorbital foramens.

In a series of 170 specimens the average distance of the foramen below the orbital margin was found to be 6.2 mm., varying between 2 and 13 mm., the position being determined largely by the growth of the nerve in relation to the osseous development.

Early in embryonic life the infraorbital nerve is on the upper surface of the membranous mass, which ossifies to form the future maxilla. If the two develop at about the same rate, the nerve will remain on the surface in a shallow sulcus except at the orbital margin, where the bone usually develops around it to form a short canal which opens on the face immediately below the orbital margin. On the other hand, the facial end of the nerve may become fixed and the bone envelop the nerve in such a manner as to form a canal the full extent of the nerve; the facial end of the canal would be deeply embedded in the upper forward angle of the maxilla and would lie at a considerable distance from the roof of the antrum as pneumatization is completed.

Thus the foramen may be some distance below the infraorbital margin, with the canal projecting upward and outward following the curvature of the maxilla. However, the canal posterior to the orbital border usually runs parallel to the midline at a distance of about 25 mm. This arrangement causes the size of the foramen and the direction of the canal to vary over a wide range, even on the two sides of the same person, and explains the difficulty occasionally encountered in attempting to enter the canal with a needle for effecting local anesthesia.

The lower mesial part of the foramen is widened and beveled, directing the needle into the canal, but the upper, outer portion presents a shelf or ledge formed by bony growth over the nerve. If the ledge is marked the opening will be directed downward and mesially and can be entered only by a curved needle directed upward and outward below the ledge. The quadratus labii superioris muscle is attached above the foramen, where a marked tubercle is often present which may be palpated during life.

The infraorbital foramen gives exit to the cutaneous branches of the infraorbital nerve, which is the terminal branch of the maxillary nerve, the second division of the trigeminus (fig. 2). These cutaneous branches supply sensory fibers to the skin and soft tissues about the upper lip, cheek, nose and lower eyelid. Some fibers enter the bone to supply the periosteum and may join the alveolar plexus. Occasionally there are one or two accessory openings mesial to the foramen for the palpebral and the lateral nasal branch. The anterior and the middle branch of the superior alveolar nerve are given off on the lateral side

Fig. 2.—Right side of the face, showing the terminal branches of the infraorbital nerve which are distributed to the soft parts. When the canine fossa is exposed surgically it may be noted that a vertical incision carried to the bone from above downward would sever many of these branches near the foramen, thus giving rise to a more pronounced and extended disturbance in sensation than would the traditional horizontal incision. These filaments do not supply the teeth, but may reach the alveolar process to anastomose with some of the terminal branches of the alveolar nerves.

Fig. 3.—Right view of an edentulous maxilla with transmitted light, showing the alveolar nerves in their course across the front wall of the maxillary sinus. They run in small canals within the bony substance. The anterior and the middle branch of the superior alveolar nerve are plainly seen, as well as the alveolar plexus. It is to be noted that on entering the antrum by way of the canine fossa a surgeon would sever both trunks. Accompanying the nerves in their osseous canals are small arteries which are passing toward the teeth and interruption of which is a real danger to the vitality of the teeth. In this specimen the nerves and blood vessels to the soft tissues have been cut at the foramen.

of the main trunk at some point behind the infraorbital foramen and continue downward in small canals within the thin bony wall (fig. 3). If they run near the surface they will be found on the inner wall in small grooves, and for this reason the lining membrane of the sinus should be gently elevated and removed, rather than curetted. The anterior branch of the superior alveolar nerve is directed downward and mesially below the infraorbital foramen, where it is at times exposed for a short distance on the facial surface of the bone and might be severed in the making of a vertical incision if the incision were carried to the bone at this point.

SURGICAL APPLICATION OF KNOWLEDGE OF THE STRUCTURE

Selection of Patients and Technics.—When one is convinced that a surgical procedure is inevitable or is necessary to bring about a cure, he should proceed to determine the type of operation best suited for the patient, the object being not only to relieve the symptoms present but to be certain that a more distressing situation is not created. The technic selected should then be designed to remove the pathologic condition with a minimum of trauma to surrounding tissues. It is my conviction that a surgical intervention on a sinus if indicated, should be complete in one sitting; temporizing operations have a tendency to aggravate the condition rather than to effect a permanent cure. In order to bring about these objectives one must visualize the operation, which in a case of involvement of the maxillary sinus is best accomplished through the canine fossa. The ease with which a Caldwell-Luc or a Denker operation may be accomplished depends on the depth of the canine fossa and the forward extension of the sinus in the nasal process. Lateral and intraoral roentgenograms will help determine the extent of pneumatization in this region and should be carefully studied before a surgical procedure is attempted. A thin, narrow face would indicate a deep canine fossa, and therefore one on which operation is more difficult; it would necessitate the removal of a great amount of bone to complete the Denker technic.

Preparation of the Patient.—The patient should have complete confidence in the surgeon, and his mind should be at perfect ease. The object and the essential steps of the operation should be explained and above all the possible after-effects. After a Caldwell-Luc or a Denker operation there is more or less anesthesia of the incisor teeth, which may also involve the cuspid and bicuspid teeth if the middle branch of the superior alveolar nerve is in the surgical field. The disturbance in sensation is usually temporary but may be permanent. The annoyance is greatly minimized if the patient is aware of the possibility beforehand.

Operations through the canine fossa are usually best accomplished with the region under local anesthesia, which necessitates injection of

the anesthetic into the infraorbital nerve in the canal. Since the foramen is deep in the fossa, usually facing the central incisor of the opposite side, a needle with a gentle curve is inserted to the bottom of the fossa in an upward and outward direction; the bevel of the needle should be toward the bone, for this facilitates entrance. One may with the point of the needle feel the overhanging ledge just above the foramen.

Incision.—In the literature for many years there have appeared from time to time discussions as to the relative merits of the longitudinal and of the vertical incision, particularly with regard to the disturbance of sensation to the teeth. Advocates of the vertical incision contend that less damage to the nerves follows that incision as it is in the direction of the nerve fibers. They lose sight of the fact that the alveolar nerves, the source of sensation to the teeth, travel in canals within the bony wall which are often running in a direction at a right angle to such an incision and might be injured in instances in which there is a dehiscence in the canal if the incision is carried to the bone at this point. The terminal portion of the infraorbital nerve, which is distributed to the soft tissues, spreads out at the foramen in a fan-shaped group of branches, many of which would be in the line of a vertical incision. Since adequate exposure is necessary to good surgical procedure and in view of the fact that a cleancut wound produces less reaction than do tissues torn and bruised by retractors, it would seem that perhaps a combination of the two types of incision, as suggested by Ziegelman,[2] offers the best possible exposure with a minimum of trauma. A vertical incision through the mucosa down to the usual horizontal incision allows for adequate exposure with little traction; the periosteum being elevated from below upward, the vertical incision is extended as one proceeds.

Surgical Window.—An opening of sufficient size to accomplish the desired result must be made through the front wall of the sinus. The alveolar nerves and blood vessels run in tiny canals within the bony wall and cannot be pushed aside. The amount of damage to the sensation and vitality of the teeth depends on whether the nerves and blood vessels are in the field of operation. The position and arrangement of the nerves and vessels are so variable that one is unable to foretell the extent of disturbance which may follow a surgical procedure in this area. Some specimens show such a network of canals that an opening could not be made without considerable damage to them; while in others there is ample room, and the canals might be avoided if one could only locate them. For this purpose a small light placed in the antrum through an opening in the nasoantral wall under the inferior turbinate bone is of great value; this is inserted after the canine fossa has been exposed,

2. Ziegelman, E. F.: The Inverted T Shaped Incision with Block Anesthesia in Radical Surgery of the Maxillary Sinus, West. J. Surg. **42**:103 (Feb.) 1934.

before the opening in the bone is made (fig. 4). The anterior superior alveolar canal will be seen to extend from a point lateral to the infraorbital foramen diagonally downward and mesially toward the incisor teeth, while the middle branch of the superior alveolar canal will take a course downward and somewhat laterally toward the canine and the bicuspid teeth. It will thus be seen that the danger of injury to the nerves increases as the infraorbital foramen is approached. Therefore, the location of the foramen determines the possible area that may be removed. In general, it may be said that the farther the foramen is removed from the orbital margin, the more it encroaches on the surgical field.

Fig. 4.—Drawing made from a specimen similar to the one used in the preparation of figure 3. The nerves and blood vessels to the soft tissues have been removed. The figure shows the posterior branch of the superior alveolar nerve running forward to connect with the middle and the anterior branch to form the superior alveolar plexus. It will be noted that the main alveolar trunk could be avoided in the event of surgical intervention through this fossa, if the surgeon could only visualize it.

It must be remembered that the vitality of the teeth is dependent not so much on the nerve supply but on the blood supply, which reaches them through small canals in the bone. Therefore, the bone near the roots of the teeth should not be removed.

SUMMARY

1. The nerve and the blood supply reach the teeth through small canals within the thin bony wall of the antrum. The arrangement is so variable that one cannot foretell the extent of possible disturbance in function after an operation through the canine fossa.

2. The direction of the incision through the soft tissues bears no relation to the disturbance of sensation in the teeth.

3. Transmitted light is of value in the locating of the alveolar canals as they cross the canine fossa.

4. The inverted T-shaped incision suggested by Ziegelman offers good exposure with a minimum of traction.

5. The infraorbital foramens are situated at variable distances below the infraorbital margin but are usually on a level with the attachment of the anterior end of the inferior turbinate bones. The opening is often directed toward the central incisor of the opposite side, a point to remember in attempting to make an injection into the canal.

6. The depth of the canine fossa has a definite bearing on the ease with which one may perform the Caldwell-Luc or the Denker operation.

PSEUDOXANTHOMATOUS TUMOR OF THE MASTOID

RÉSUMÉ OF LIPOIDOSES

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In recent years an unusual and interesting case came to my attention. After careful biopsies of tissue obtained on two different occasions, a tentative diagnosis of hemangioblastoma with pseudoxanthomatous change was made. The patient's history, the findings at operation and the results of microscopic study led to this conclusion, after a careful review of the more recent journals and available pathologic texts.

REPORT OF A CASE

A white youth aged 19 was admitted to the Robert Long Hospital on Nov. 15, 1935, with the complaints of (1) deafness in the right ear for about two years, (2) some discharge from that ear for one year but none in the past year and (3) paralysis of the right facial nerve for four months after noting of pain shooting down into the neck on the same side for a time.

The patient's own past history as well as his family history proved essentially noninformative, except that he had always contracted frequent colds.

Physical Examination.—The patient was a tall, asthenic and anemic white man with paralysis of the right facial nerve, dental caries and a tumor mass practically filling the right external auditory canal. A reduced gag reflex was obtained on the right. An inconstant rotatory nystagmus was noted when the patient looked to the right and sometimes when he looked to the left. There was hypesthesia of the right cornea and of the nasopharynx. A drooping right shoulder appeared as due to atrophic changes in the right trapezius and the sternocleidomastoid muscle. A negative Rinne reaction was elicited on the right, and the Weber test revealed lateralization to the right. Bone conduction on the right side was present but decreased. Laryngoscopic examination showed the right cord in the cadaveric position. Spinal puncture yielded fluid under a pressure of 16 millimeters of mercury; there was no change in pressure on application of the Queckenstedt test on the right.

Treatment and Progress.—An attempt on Nov. 27, 1935 to take a specimen for biopsy proved unsuccessful, owing to excessive bleeding. A satisfactory specimen was obtained at a later date, after six roentgen treatments of 200 r each. After a series of ten more such roentgen treatments, the patient was operated on, Feb. 12, 1936, and as much tumor as possible was removed from the right

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mastoid. The posterior wall of the external canal was eroded by the growth, and a portion of the petrous process was definitely involved. Complete removal of the tumor tissue was impossible, and the resultant uncontrollable hemorrhage demanded a ligation of the right carotid artery. Transfusions followed the operation. During an uneventful convalescence the patient received four roentgen treatments of 285 r each. The surgical incisions healed well, and roentgenographic check-up on the long bones revealed no malignant growth on April 24, 1937. Further check-up, on Oct. 29, 1938, showed the chest, long bones and skull to be normal except that the petrous ridge on the side which had been operated on appeared thinned. However, there was no evidence of any pathologic process in the area. Only residual paralysis of the seventh nerve and moderate deafness in the right ear remained.

Laboratory Findings.—Specimens of the spinal fluid were normal. The blood cholesterol readings were 47 and 58 mg. per hundred cubic centimeters, and the basal metabolic rates on three occasions were —12, —19 and —15, respectively. Roentgenographic examination of the right mastoid showed haziness of both the mastoid and the external auditory canal. The petrous tip on the right showed some destruction. Both antrums and frontal bones appeared to be involved to some extent.

The biopsy report by Dr. C. G. Culbertson, pathologist, Indiana University Medical Center, read as follows:

Gross Observations: "The specimen consists of several small pieces of soft tissue and bone. The bony tissue is decalcified, and the soft parts sectioned are without decalcification."

Microscopic Observations: "Study of the many small pieces removed shows some rather dense bone with some evidence of rearrangement of its structure. Many pieces are present which do not show any pathologic process. One or two areas show a very vascular type of tissue apparently proliferating inside the bone, causing apparent atrophy of the bony trabeculae. On further study this is seen as an unusual type of tissue which is the combination of small and large blood channels between which are situated masses of a somewhat indistinct type of cell apparently resting in areas of fibrous tissue. Some of the larger cells contain small vacuoles, and many vacuoles of fat are seen in the connective tissue. The predominating histologic picture is doubtless the multiple blood channels, which in itself suggests a hemangioma. Study of the endothelium of these blood vessels shows it quite distinct, and in some areas it is suggested that the small irregular masses of indistinct cells may have been derived from proliferation of the capillary endothelium. Study of the soft tissue removed reveals a variety of tissue, some areas showing a fibrous structure containing blood channels and nests of these same indistinct masses."

Tentative Diagnosis: "Hemangioblastoma showing pseudoxanthomatous change."

COMMENT

In substantiation of Dr. Culbertson's assumption I quote Penfield[1] on hemangioblastoma found as a primary tumor of the central nervous system:

This tumor occurs most frequently as a nodule in the wall of cysts of the cerebellum. Unless a careful search is made for the mural nodule a diagnosis is

1. Penfield, W.: Cytology and Cellular Pathology of the Nervous System, New York, Paul B. Hoeber, Inc., 1932, vol. 3, pp. 942-945.

apt to be given of gliomatous cyst. Similar tumors also develop as solid nodules, especially at the posterior extremity of the fourth ventricle and in the spinal cord. They are often associated with angiomatosis retinae and with various peripheral lesions such as cystic pancreas, cystic kidney, cavernoma of the liver, etc., to form a pathological complex now known as Lindau's disease (1926).

The tumors in the central nervous system consist essentially of a myriad of capillary spaces, but by proliferation of the endothelium a more solid tissue may be produced (hemangio-endothelioma) or by dilatation of the capillary spaces a cavernous structure may result.

The variant most apt to be confused with a glioma is the solid endotheliomatous type. . . . It can usually be distinguished by the network of reticulum which permeates the tumor between the cells, or by the fact that the neoplastic cells are filled with lipoidal granules to form what are known as "pseudo-xanthomatous" cells. . . .

One of the best reviews concerning hemangioblastomas is found in the book "Tumors Arising from the Blood Vessels of the Brain." [2] This work proposed the idea that these tumors arise from vasoformative cells and that the resultant hemangioblastomas may vary from a cystic to a solid tumor and may have any degree of vascularity. Therefore, the macroscopic picture tends to differ considerably, even though microscopically an intimate relation is observed. In regard to angioblastic formations in the cerebellum, a common site for the anomaly, a greater number are found to be cystic, with perhaps only a small mural nodule of tumor tissue present. Judging from the series of cases reported in this book, its authors concluded that the tumors "pass by gradations from the simple capillary form of tumor to the cavernous and the cellular forms, and that no tumor is, architecturally speaking, pure in type."

The removal of these growths may require only a simple enucleation, whereas, on the other hand, much difficulty may be encountered. Along this line Cushing [3] stated:

The tumors may be associated with such a formidable degree of vascularity the attempt even to take tissue for verification would be regarded as foolhardy. It is in these truly desperate cases that electro-desiccating procedures may prove most helpful, but at best the surgical removal of one of these tumors is attended with the greatest possible hazard.

The histologic descriptions given by the authorities just referred to compare well with the microscopic observations which in my case prompted the diagnosis of hemangioblastoma with pseudoxanthomatous change.

REVIEW OF LIPOIDOSES

A review of the literature while I was studying this case led me into the bewildering field concerned with xanthomatous pathology and its

2. Cushing, H., and Bailey, P.: Tumors Arising from the Blood Vessels of the Brain, Springfield, Ill., Charles C. Thomas, Publisher, 1928.

3. Cushing, H.: Intracranial Tumors, Springfield, Ill., Charles C. Thomas, Publisher, 1932, p. 123.

numerous aspects. It seems pertinent, therefore, to outline briefly present day thought on this subject, particularly as it affects the otolaryngologist.

The term "lipoidoses" seems most suitable as a heading for this group of pathologic entities, which includes such extremes as xanthelasma and the Hand-Schüller-Christian syndrome. It is generally agreed that the disturbed lipoid metabolism is at least one characteristic all these conditions have in common. The word syndrome is used because such conditions are actually symptom complexes rather than disease by definition.

Xanthoma Tuberosum.—Following the classification proposed by L. Pick,[4] one can consider first the localized forms of lipoidoses, which seemingly may or may not be neoplastic. Typically, microscopic examination shows a few foam cells in intimate relation with the adventitia of small blood vessels situated subcutaneously or under mucous membranes.[5] Later the cells tend to enlarge, and coalescence of some gives rise to Teuton giant cells. Foreign body giant cells may also be present. Connective tissue cells are particularly prone to fatty degeneration.

Histologic study leads to the consideration of plausible etiologic factors. Trauma (particularly when long continued), hereditary factors, inflammatory processes, deficiency diseases, jaundice and numerous other conditions seem to play a part at times. It is fairly generally believed that the phagocytosing cells of the reticuloendothelial system give rise to the foam cells, and yet the fundamental reason for this cannot be ascertained. The color of the nodules is thought to be due to a combination of carotenoid pigments with cholesterol esters. Cause will again be touched in the discussion of each other form of lipoidoses to be described, but in no instance will the discussion be any farther beyond the hypothetic stage than in the case of the comparatively simple xanthoma.

Localized xanthomatous nodules are usually multiple; however, certain sites have been reported that are of particular importance to the otolaryngologist. Besides those records in the literature of xanthoma tuberosum on the neck,[6] on the eyelid (these xanthelasmas being the most frequent form of xanthoma), on the tendon sheaths [7] and in other

4. Pick, L.: A Classification of Diseases of Lipoid Metabolism and Gaucher's Disease, Am. J. M. Sc. **185**:453-469 (April) 1933.

5. Plewes, L. W.: Nature and Origin of Xanthoma Cell, Arch. Path. **17**: 177-186 (Feb.) 1934.

6. Humiston, C. E., and Piette, E. C.: Xanthoma of Neck, Ann. Surg. **88**: 124-128 (July) 1928. Charache, H.: Congenital Xanthoma Tuberosum, Am. J. Cancer **31**:563-566 (Dec.) 1937.

7. Gomori, G.: Uncommon Tumor (Xanthoma of Tendon Sheath), Am. J. Surg. **33**:150-156 (July) 1936.

locations, the reports of more interest show involvement of the pharynx [8] and the larynx [9] and, in some of the cases of laryngeal involvement, the trachea. Laryngeal damage may be extensive and is another possible cause of hoarseness. The degree of damage in some of these cases necessitated tracheotomy before other therapeutic measures could be considered. The distortion of the tissue involved results largely from the fibrosis which is apt to follow the initial inflammatory and tumorous processes.

Xanthomatous tumors have also been reported recently in relation with the external auditory canal [10] and with the mastoid process.[11] In the case of the latter condition both mastoid processes were extensively involved, and there was erosion of the dural plates as well as extension into the antrum and labyrinth. Consequently the removal of all tumor tissue was out of the question. The patient, just before her death because of terminal pneumonia, began to show numerous bony defects in the skull, two defects in the right tibia, larger mastoid lesions and defects in the seventh rib bilaterally. These findings warranted the conclusion that this condition belonged in the Schüller-Christian group. In this case, as in many of these cases, it is impossible to make a clear-cut diagnosis as to whether the condition should be considered as xanthomatosis or as the Hand-Schüller-Christian syndrome. Treatment in this case consisted of roentgen therapy, transfusions and administration of solution of posterior pituitary thyroid, liver extract and vitamins, together with other measures, to no avail.

Treatment for these tumors is best discussed in the following section, on xanthomatosis. Fortunately xanthomas usually are benign, although they are prone to recur and may give rise occasionally to sarcomatous changes or, less frequently, to the development of carcinoma.

Xanthomatosis.—Coming to the generalized forms of lipoidoses, one must at least mention the symptomatic, or secondary, forms, in which the manifestations of disturbance in lipoid metabolism accompany such

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8. Pollock, H. L.: Head and Neck Manifestations (of Xanthoma) in Metabolic Disorders, Ann. Otol., Rhin. & Laryng. **43**:553-560 (June) 1934.

9. Schatz, H. A.: Xanthoma of Larynx, Laryngoscope **40**:300-301 (April) 1930. Finney, W. P.; Montgomery, H., and New, G. B.: Xanthoma Multiplex: Two Cases Involving Larynx and Trachea, and Associated with Diabetes Insipidus, J. A. M. A. **99**:1071-1074 (Sept. 24) 1932. New, G. B.: Xanthoma of Pharynx and Larynx, Arch. Otolaryng. **22**:449-453 (Oct.) 1935. Weidman, F. D., and Schaffer, H. W.: Xanthoma of Skin and Larynx Associated with Carcinoma of Stomach and Regressive Xanthoma of Pons, Arch. Dermat. & Syph. **35**:767-814 (May) 1937.

10. Rosenberger, H. C.: Solitary Xanthoma of External Auditory Canal, Arch. Otolaryng. **26**:395-399 (Oct.) 1937.

11. Wood, V. V.: Bilateral Xanthomatosis (Lipoidosis) of Mastoid: Case, Ann. Otol., Rhin. & Laryng. **46**:991-1008 (Dec.) 1937.

diseases as diabetes, chronic hepatic disease and jaundice. The resultant yellow or brown nodules usually appear on the extensor surfaces and almost invariably show surrounding inflammatory manifestations when associated with diabetes.

The essential, or primary, forms, resulting from some underlying constitutional anomaly of lipoid metabolism, include the so-called xanthomatoses. These might be called lipoid histiocytosis or lipoid granulomatosis.[12] To explain why such generalized primary xanthomatosis collections develop, Rowland [13] and others have suggested that lipoids in excess irritate vessel walls, causing them to produce some infiltration of perivascular cells and some degeneration. The lesions then result from the phagocytic action of the reticuloendothelial system. Other workers [14] have proposed that there is an underlying intracellular disturbance in the reticuloendothelial cells themselves which brings about the production of xanthoma cells with or without an accompanying lipemia. This theory tends to explain why only certain sites in the body are involved. The fact that many patients fail to show an appreciable hypercholesteremia discounts the hypothesis that the increase in cholesterol is the causative factor. Therefore, the idea of a lipoid imbalance between certain cells and the blood stream or of a disturbance in lipoid metabolism, either locally or generally, seems the most plausible theory, even though a patient may show either of these in some other condition without the appearance of xanthomatosis. Controversy over the etiologic factors enumerated has prompted Sugg and Stetson [15] to raise the following question: In this case (one of xanthomatosis) "are we dealing with a simple disease of the skin due to some unknown metabolic disturbance, or is this a mild form of some grave constitutional disease?"

Patients with this condition may or may not show involvement of the mucous membrane. External lesions are more apt to be found on flexor surfaces, and these frequently send the patient to his doctor. There may be an accompanying diabetes insipidus. The amount of blood cholesterol is, as a rule, not elevated, although a definite increase

12. Smith, L. A.: Xanthomatosis Involving Bone: Case Reports and Roentgen Findings, Radiology **24**:521-534 (May) 1935.

13. Rowland, R. S.: Xanthomatosis and the Reticulo-Endothelial System: Correlation of Unidentified Group of Cases Described as Defects in Membranous Bones, Exophthalmos and Diabetes Insipidus, Arch. Int. Med. **42**:611-674 (Nov.) 1928.

14. Thannhauser, S. J., and Magendantz, H.: The Different Clinical Groups of Xanthomatous Diseases: A Clinical and Physiological Study of Twenty-Two Cases, Ann. Int. Med. **11**:1662-1746 (March) 1938.

15. Sugg, E. S., and Stetson, D. D.: Xanthoma Tuberosum Associated with Trauma and Mild Diabetes Mellitus, J. A. M. A. **108**:414-417 (Aug. 7) 1937.

in tissue cholesterol has been shown.[16] Treatment consists chiefly in low fat diet, roentgen therapy, general supportive care and excision of any nodules as indicated.

Hand-Schüller-Christian Syndrome.—This syndrome appears about as well established as any of those included in this general group. One case in which the condition involved particularly the mastoids has previously been mentioned. For some unknown reason in the affected patient (more often male) cholesterol and its esters[17] are abnormally stored and a characteristically granulomatous tissue is produced in the involved areas.

Characteristic findings are: (1) irregular osseous defects (particularly of the skull) of moth-eaten appearance; (2) exophthalmos; (3) diabetes insipidus; (4) retarded skeletal growth; (5) cholesteremia; (6) gingivitis,[18] and (7) loss of teeth due to deposition of fat in the apexes.[8] Dyspnea, cyanosis, sphenohepatomegaly, lymphadenopathy and yellowish brown discoloration of the skin are also possible. The amount of general deposition of lipoid is usually less marked than in the Niemann-Pick syndrome. Aural manifestations, such as pain, dizziness and functional loss of hearing, are apt to appear, because the temporal and parietal bones are most frequently involved. The lateral sinus, dura, middle ear, labyrinth and petrous pyramid have been attacked.[19] The exophthalmos is due to orbital softening.

Remissions are the rule, more so if the condition is treated. However, the syndrome rarely permits an afflicted person to live beyond the third decade. Treatment at present includes a low fat and low cholesterol diet, administration of solution of posterior pituitary for the control of the diabetes insipidus and roentgen therapy applied to the lesions. The pathologic condition in the Hand-Schüller-Christian syndrome is radiosensitive, so that surgical intervention should be avoided. The prognosis is made worse by surgical attempts, and Shea[20] cited 2 cases in which death followed operation.

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16. Montgomery, H., and Osterberg, A. E.: Xanthomatosis: Correlation of Clinical Histopathologic and Chemical Studies of Cutaneous Xanthoma, Arch. Dermat. & Syph. **37**:373-402 (March) 1938.

17. Sobotka, H.; Reiner, M.; Glick, D., and Tuchman, L.: The Lipoids of Spleen and Liver in Various Types of Lipoidoses, Biochem. J. **27**:2031-2034, 1933.

18. Mettel, H. B.: Xanthomatosis, Am. J. Dis. Child. **42**:858-863 (Oct.) 1931.

19. Druss, J. G.: Aural Manifestations of Lipoid Granulomatosis (Hand-Schüller-Christian's Disease), Ann. Otol., Rhin. & Laryng. **45**:693-702 (Sept.) 1936.

20. Shea, J. J.: Xanthomatosis (Schüller-Christian's Disease): A Report of a Case with Radiosensitive Pathology in Mastoid, Laryngoscope **48**:589-598 (Aug.) 1938.

Gaucher's Syndrome.—This syndrome is often called familial splenic anemia and was first described in 1882. Mandelbaum and Downey, thirty-four years later, discovered the underlying metabolic disturbance. Since then the lipoid that is stored in Gaucher's syndrome has been found to be kerasin, a cerebroside.[17] In contrast, this symptom complex occurs much more in females and in Jews. In this syndrome also the basic etiologic factor has not been determined.

Early findings are cachectic symptoms, splenomegaly, yellow brown to ochre spotting of the skin (particularly on the face, neck and hands) and hypochromic anemia. Hepatomegaly, leukopenia, pain in the lower ends of the tibia and femur and tenderness over the sternum and ribs, due to bony involvement,[4] appear later. The cortex osseum in these areas appears on roentgen examination to be thinned. Diagnosis can be made on the basis of the symptoms and on that of Gaucher cells shown by biopsy of involved bone marrow removed by punch. The latter are large cells with one or more nuclei and a glossy, homogeneous spongioplasm. These cells are seen also in the liver and spleen, being derived from reticulum cells.

Treatment has proved ineffective, and the patient usually dies of some intercurrent infection in the early decades.

Niemann-Pick Syndrome.—This condition is similar to Gaucher's syndrome, but more rare. It is congenital, hereditary and more frequent in females and in Jews. Although etiologic factors of this condition too are unknown, it has been proved that a storage of phosphatides occurs, with an increase in other lipoids.[17] These are abnormally stored in reticuloendothelial connective tissue and in epithelial cells, so that eventually function is too affected to permit life. Hypothetically, some profound disturbance of fatty metabolism must underlie such a condition.

The infant with this syndrome shows rapid abdominal enlargement, together with sphenohepatomegaly and mild ascites, yellowish brown discoloration of exposed skin, mild anemia, edema and a varying degree of lymphadenopathy. As an aid in diagnosis, vacuoles are found in the polymorphonuclears and the lymphocytes.

Treatment is ineffective and awaits more knowledge concerning cause. Unfortunately the condition proves fatal, as a rule, by the fourth year.[21]

Amaurotic Family Idiocy and Tay-Sachs Syndrome.—Briefly, these afflictions can be described as a fundamental disturbance in lipoid metabolism, in which the deposition is confined more to the ganglionic

21. Rogers, F. M.: Xanthomatosis of Orbit (Lipogranuloma) in Patient with Diabetes Insipidus, Am. J. Ophth. **17**:1141-1145 (Dec.) 1934.

and glial cells.[22] The name Tay-Sachs syndrome designates in present usage a more severe, fulminating type of amaurotic family idiocy.

Extracellular Cholesterosis.—This was first described by Kerl, of Vienna, in 1930 as a condition in which cholesterol and cholesterol esters are deposited extracellularly.[8] Characteristic findings are hepatic disturbances and yellowish blue nodules of glassy transparency on the skin and on the mucous membrane of the mouth and pharynx. It has been shown that hypolipemia is more common. Roentgen therapy serves efficiently.

Lipoid Proteinosis.—Urbach and Wiethe in 1924 reported this condition as resulting from the deposition of acetone-soluble lipoid in physical combination with an unknown lipoid.[8] Patients so affected complain of repeated oral and pharyngeal inflammations with resultant small scars. These are due to initial yellowish, plaquelike elevations on the inner surface of lips, palate and tongue. The latter may become so involved as to result in partial destruction of some mobility and taste. Other mucous membranes may be involved; in fact, tracheotomy has been required. Treatment is yet unfavorable.

SUMMARY

My purpose in this paper has been to describe a condition appearing as a hemangioblastoma with pseudoxanthomatous change and to discuss briefly the present day knowledge concerning the various lipoidoses.

A case in which a tentative diagnosis of hemangioblastoma with pseudoxanthomatous change was made is reported.

The pathologic observations in the reported case are compared with those of reliable authorities.

It is noted that surgical removal of such growths often proves difficult or impossible.

Consideration of the literature concerning xanthomatous pathology prompts a review of the "lipoidoses," a suitable term because all the conditions falling into this group have some underlying disturbance of lipoid metabolism.

Xanthoma tuberosum is described as a form of localized lipoidosis. Etiologic factors are stressed.

Xanthomatosis is a more common form of generalized lipoidosis. As to its cause, perhaps the best one can do is to hypothesize that a lipoid imbalance between certain cells and the blood stream or a disturbance in lipoid metabolism, either locally or generally, accounts for the characteristic pathologic condition.

22. Pick, L.: Niemann-Pick's Disease and Other So-Called Xanthomatoses, Am. J. M. Sc. **185**:601-616 (May) 1933.

In the Hand-Schüller-Christian syndrome an abnormal storage of cholesterol and its esters occurs. The most characteristic findings include exophthalmos, diabetes insipidus and osseous defects (particularly in the skull) of moth-eaten appearance.

Gaucher's syndrome, or familial splenic anemia, is accompanied by the lipoid storage of kerasin. Diagnosis is made on the basis of symptoms and of Gaucher cells shown by biopsy of involved bone marrow removed by punch. Prognosis is not good.

Phosphatides are stored extensively within the cells in the Niemann-Pick syndrome. Consequently the physiologic processes are so damaged that the afflicted infant dies, as a rule, by the second to the fourth year.

For completeness amaurotic family idiocy, the Tay-Sachs syndrome, extracellular cholesterosis and lipoid proteinosis are described briefly.

In all these types of lipoidoses treatment awaits, for the most part, further experimentation in regard to underlying cause.

CAVERNOUS SINUS THROMBOSIS

REPORT OF RECOVERY FOLLOWING SULFAPYRIDINE THERAPY

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The subject of cavernous sinus thrombosis has been ably presented and discussed by various authors, notably by Dwight and Germain,[1] Eagleton,[2] Turner and Reynolds [3] and Irish.[4] It is the purpose of this paper to present data on a patient who recovered from cavernous sinus thrombosis and to give the details of therapy. Sulfapyridine was used as the chemotherapeutic agent.

Turner and Reynolds,[3] like most authors, described acute and chronic forms of cavernous sinus thrombosis. The acute fulminating type has a high mortality. It spreads rapidly by direct extension, usually along the ophthalmic veins, traveling with, rather than against, the normal venous flow. The chronic type is more insidious in onset. The infection usually has its origin in the middle ear and gains entrance to the cavernous sinus by way of a retrograde thrombosis of the petrosal sinuses. Cavenagh [5] pointed out that chronic thrombosis of the cavernous sinus has a lower mortality rate than the acute form. The case to be presented is typical of the acute fulminating type.

The diagnosis of cavernous sinus thrombosis in a patient who recovered and on whom surgical intervention was not employed to visualize the thrombosis and allow removal of adequate material for histologic study is justly open to criticism. In a few instances, a perusal of the available literature on the reported cases of recovery brings forth

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1. Dwight, E. N., and Germain, H.: Thrombosis of the Cavernous Sinus with Report of Four Cases Including One Cranial Operation, Boston M. & S. J. **146**:456, 1902.

2. Eagleton, W. P.: Cavernous Sinus Thrombophlebitis, New York, The Macmillan Company, 1926.

3. Turner, L. A., and Reynolds, E. F.: Intracranial Pyogenic Diseases, Edinburgh, Oliver & Boyd, 1931.

4. Irish, C. W.: Sinus Thrombosis: Cavernous Sinus Thrombosis, Ann. Otol., Rhin. & Laryng. **47**:411 (June) 1938.

5. Cavenagh, J. B.: Cavernous Sinus Thrombosis: Study of Cases of Recovery, Brit. M. J. **1**:1195 (June 13) 1936.

questions as to the authenticity of such a diagnosis in the mind of the least skeptical reader. Eagleton [2] outlined certain points essential to allow the diagnosis. They are: (1) a known site of infection; (2) evidence of infection of the blood stream; (3) early signs of venous obstruction in the retina, conjunctiva or eyelid; (4) paresis of the third, fourth and sixth nerves resulting from pressure caused by inflammatory edema; (5) the formation of an abscess in the neighboring soft tissues, and (6) evidences of meningeal irritation.

The findings in the case presented fulfil all of these requirements, and we feel that an evaluation of the clinical and laboratory data substantiates the diagnosis of cavernous sinus thrombosis against the most severe criticism.

It is well known that thrombophlebitis of the cavernous sinus is a serious disease. Abercrombie [6] recognized this fact when he described the disease for the first time in 1818. In 1902 Dwight and Germain [1] collected reports of 182 cases of cavernous sinus thrombosis and found that 7 per cent of the patients recovered spontaneously. Since that time the mortality rate has not changed. Chisolm and Watkins,[7] in 1920, noted that of those patients operated on less than 7 per cent recovered. In 1926, Eagleton [2] personally observed 25 patients with cavernous sinus thrombosis, of whom 3 recovered. Five years later, Turner and Reynolds [3] reported 22 cases with only 1 recovery. Irish,[4] in his analysis of 34 cases in which postmortem examination was made, found that in 14 cases, or 41 per cent, the infectious source was at, or about, the nose and upper lip. The infecting organism almost invariably was proved to be Staphylococcus aureus. Early in 1939, Barnshaw [8] reported the recovery of a patient who had staphylococcic cavernous sinus thrombosis following treatment with sulfanilamide, and in the same year Seydell [9] reported a case in which treatment with sulfanilamide was given. Presumably the infecting organism in Seydell's patient was the hemolytic streptococcus, though cultures were taken only from the ear, which was the focus of infection.

O'Brien and McCarthy [10] in 1938, suggested the value of sulfapyridine in treatment of serious staphylococcic infections, and since that

6. Abercrombie, J.: Pathological and Practical Researches on Diseases of the Brain and Spinal Cord, Philadelphia, Lea & Blanchard, 1843.

7. Chisolm, J. J., and Watkins, S. S.: Twelve Cases of Thrombosis of the Cavernous Sinus, from a Study of Fifty Thousand Surgical Histories in Johns Hopkins Hospital, Arch. Surg. **1**:483 (Nov.) 1920.

8. Barnshaw, H. B.: Report of a Case of Bilateral Cavernous Sinus Thrombosis: Recovery Without Operative Intervention, J. M. Soc. New Jersey **36**:22 (Jan.) 1939.

9. Seydell, E. M.: Recovery from Thrombosis of the Cavernous Sinus, Arch. Otolaryng. **30**:429 (Sept.) 1939.

10. O'Brien, E. J., and McCarthy, C. J.: Staphylococcal Septicemia Treated with M. & B. 693, Lancet **2**:1236, 1938.

time others have verified its effectiveness. Long and Bliss [11] pointed out that sulfapyridine is the most effective chemotherapeutic agent against the staphylococcus thus far developed. With this in mind, we present the record of a patient treated with sulfapyridine for acute staphylococcic cavernous sinus thrombosis.

REPORT OF A CASE

W. S., a boy 5 years of age, of Greek parentage, entered the isolation department of the San Francisco City and County Hospital on July 27, 1939, because of possible erysipelas. He had been in good health until six days before his admission, at which time it was noticed that he had a "small pimple" at the tip of his nose on the left side. The parents said that the child had "picked" at the lesion several times. Three days prior to entry, the nose was red and swollen and the left eye appeared "puffy." The redness and swelling increased. On the morning of the patient's admission to the hospital both eyes were swollen shut. The staff examined

Cavernous sinus thrombosis. *A*, during the acute phase. *B*, seventeen days later, after treatment with sulfapyridine.

the patient and thought that he had acute ethmoid or frontal sinusitis. He was then transferred to the ear, nose and throat service.

Examination on the evening of July 28 showed the boy to be acutely ill. He weighed 38.5 pounds (17.5 Kg.). The temperature was 104.4 F., the pulse rate 148 and the respiration rate 36. The child lay in an opisthotonos posture and was listless and unresponsive. There was a small, almost healed lesion at the site of the initial infection on the left ala nasi. (This area is still faintly discernible in view *A* of the figure, taken on August 2. It should not be confused with the easily seen localized abscess that developed medial to, and slightly below, the inner canthus of the left eye.) There was a diffuse swelling of the soft tissues of the forehead, the bridge of the nose and the left side of the face. The skin had a purplish hue. The superficial branches of the left angular vein appeared to be thrombosed. There were numerous prominent, dark veins over the forehead, left cheek and chin. Both eyes were swollen shut, and there was discoloration of the swollen tissues, as shown in view *A* of the figure. Edema of the conjunctiva

11. Long, P. H., and Bliss, E. A.: The Clinical and Experimental Use of Sulfanilamide, Sulfapyridine and Allied Compounds, New York, The Macmillan Company, 1939.

and chemosis were present in both eyes. The extraocular movements were markedly limited in all directions. The pupils reacted to light and in accommodation. It was difficult to examine the fundi. The disk margins were blurred and the retinal vessels engorged. No retinal hemorrhages or choking of optic disks was noted.

The reflexes were hyperactive. There was a suggestion of stiffness of the neck. Kernig's and Brudzinski's signs were questionably positive, and Babinski's sign was normal.

Laboratory Findings.—The urine was normal in all respects and remained so throughout the course of sulfapyridine therapy and the period of hospitalization, as ascertained by daily examination.

The results of examination of the blood are shown in the following tabulation:

	On Entry	Greatest Variation	On Discharge
Hemoglobin	100%	72%	85%
Red blood cells	5,300,000	4,460,000	4,500,000
White blood cells	18,100	38,950	13,200
Polymorphonuclears	75%	84%	68%
Filamented cells	46%	68%	48%
Nonfilamented cells	29%	16%	20%

The hemoglobin value and white blood cell count were determined daily during the course of the sulfapyridine therapy.

Culture of the blood revealed a positive growth of hemolytic Staph. aureus.

Tests with both human and bovine tuberculins in dilutions of 1:1,000 gave negative results.

Lumbar puncture was performed at the time of admission, because of signs of meningeal irritation, and the pressure of the spinal fluid was 150 cm. of water. The Queckenstedt maneuver showed both lateral sinuses to be patent. There were no cells and no bacterial growth. The reaction to the Pandy test was negative.

Roentgen examination showed normal accessory nasal sinuses.

Treatment.—Sulfapyridine therapy was started on July 29, the day after admission, after a report from the laboratory that blood obtained the day before showed a heavy growth of hemolytic Staph. aureus. The child received 1 Gm. (15 grains) of the drug every four hours, a total of 6 Gm. (90 grains) each twenty-four hours; that is, the patient received 0.34 Gm. per kilogram, or slightly over 2⅓ grains per pound, of body weight, each twenty-four hours. Daily titers showed that this dosage maintained a sulfapyridine level in the blood stream of not less than 10.4 nor more than 16.5 mg. per hundred cubic centimeters. This dosage was maintained for nine days, and then, because the patient was making such excellent progress, the amount was gradually diminished until, after six more days, the drug was withheld entirely. Sodium bicarbonate was administered in amounts equal to those of the sulfapyridine. The total amount of sulfapyridine administered was 63 Gm. (945 grains). No nausea or vomiting was noted. There was moderate cyanosis of the lips and finger nails. There was no evidence of jaundice, hemolytic anemia or renal damage. The patient received five daily transfusions of 250 cc. of nonimmunized blood. The eyes were treated with 5 per cent boric acid ointment.

The question as to the advisability of supplementing or even supplanting the sulfapyridine therapy with staphylococcus toxoid or antiserum arose as soon as it was established that the blood culture showed a positive growth of Staph. aureus. When the report of the culture of the material removed from the abscess likewise showed a pure culture of hemolytic Staph. aureus, there was another wave of enthusiasm in favor of instituting specific therapy with the biologic preparations. We did not deem it advisable, and in retrospect we are pleased that the ultimate results are not confused by two or more forms of therapy.

The total fluid intake and output were recorded daily. The intake of fluid ranged between 2,300 and 3,000 cc. in twenty-four hours. From 500 to 1,000 cc. of a 5 per cent solution of dextrose was administered intravenously daily to bring the fluid intake up to the desired level. The urinary output was from 1,200 to 1,500 cc. per day.

Course.—The swelling about the eyes increased, and three days after entry the right eye protruded more than the left, as shown in the figure. Dr. W. D. Horner, of the ophthalmic service, examined the patient at that time and found both eyes swollen, proptosis present and the conjunctiva of the right globe irregularly swollen. The ocular movements were limited in all directions. There was edema over the brow, showing impeded venous return. The periocular tissues were discolored and swollen. The cornea was normal. The pupils reacted promptly to light. The right disk was not seen in detail. The outlines of the left disk were blurred, but the disk was not definitely choked. Dr. Horner stated the opinion that the proptosis, the edema of the brow and the blurred disks warranted the diagnosis of cavernous sinus thrombosis.

The edema about the eyes and forehead became fluctuant on the fourth day after entry. An abscess pointed about 1 cm. medial to the inner canthus of the left eye along the nasal bridge. This was incised and drained. About 10 cc. of pus was expressed from along the eyelids, nose and forehead, and a short rubber drain was inserted. The wound continued to discharge for several days, after which the rubber drain was removed. Culture of the pus from this abscess yielded an uncontaminated growth of hemolytic Staph. aureus.

The patient's temperature dropped gradually, became normal eleven days after his entry to the hospital and has remained so. The dose of sulfapyridine was decreased beginning on the eleventh day, and the use of the drug was stopped entirely on the sixteenth day.

The proptosis, edema and discoloration about the eyes receded slowly, so that on the ninth day after entry the child could open his eyes about halfway. The chemosis disappeared more slowly. When the patient was discharged, twenty-eight days after entry, there was still slight edema of the conjunctiva of the right eye, but one month later this was entirely gone. Three months after the patient's discharge, his extraocular movements and vision were normal; the urine, examined for possible renal damage resulting from sulfapyridine therapy, was normal. The boy gained over 6 pounds (2.7 Kg.) during the three months.

COMMENT

Thus far no reports have appeared in the literature pertaining to the use of sulfapyridine in the treatment of cavernous sinus thrombosis. It is inevitable that the drug will be used in the treatment of this disease, as there is suggestive evidence of its chemotherapeutic value against other staphylococcic infections.

Long and Bliss [11] observed that each patient differs in rate of absorption and excretion of sulfanilamide and its allied compounds. This is borne out in our experience in treating patients with sulfanilamide and with sulfapyridine, especially with the latter. When the drug sulfanilamide is indicated, one can be fairly certain that the administration of 0.15 Gm. per kilogram (approximately 1 grain per pound) of body weight in twenty-four hours will usually maintain a level in the blood

of from 10 to 15 mg. per hundred cubic centimeters. Hobson and McQuaide [12] showed that such is not the case with sulfapyridine. We have observed various patients treated with sulfapyridine who have had greater fluctuations in absorption and excretion of the drug. In the treatment of the patient in the case just reported it was necessary to administer 0.34 Gm. per kilogram of body weight (2⅓ grains per pound) each twenty-four hour period to maintain a level in the blood of from 10 to 15 mg. per hundred cubic centimeters. This is more than twice the expected dose of sulfanilamide.

In the use of sulfanilamide, various authors recommend the restriction of intake of fluids in order to obtain and maintain a higher concentration of the drug in the body. We believe that in the use of sulfapyridine as a chemotherapeutic agent this is a dangerous procedure. Molitor [13] showed in experimental animals that when high concentrations of sulfapyridine are administered there is a decrease in renal function, as well as subsequent development of sulfapyridine calculi. Indeed, Long and Bliss [11] have a special added chapter in their book, stressing that they had observed several patients being treated with sulfapyridine who suffered from anuria and presented evidences of decreased renal function. The toxic manifestations have been shown to result from acetylsulfapyridine calculi in the renal tubules and kidney pelvis. Tsao, McCracken, Chew, Kuo and Dale [14] recently reported 5 cases of renal complications following sulfapyridine therapy. One child died, and postmortem examination revealed calculi in the ureters. Unfortunately, the calculi were not examined for sulfapyridine. Recently, we saw the postmortem examination of a child who died of tuberculous meningitis and who had been treated with large doses of sulfapyridine. Within the ureters and renal pelvis were numerous crystals. Unfortunately, the organs were placed in a 4 per cent solution of formaldehyde, and the crystals disappeared before they could be analyzed. Long and Bliss [11] suggested the use of sodium bicarbonate with sulfapyridine therapy, with the hope that an alkaline urine might inhibit formation of acetyl sulfapyridine in the kidneys. We wish to point out that the patients reported on by Tsao and others, as well as the child with tuberculous meningitis, received sodium bicarbonate and had alkaline urine, yet showed renal damage resulting from the administration of sulfapyridine. Until more is known about the action of acetyl sulfapyridine on the kidneys it may be wiser to force, rather than restrict, the intake of fluids.

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12. Hobson, F. G., and McQuaide, D. H. G.: Treatment of Meningococcal Meningitis with 2-Sulphanilyl-Amidopyridine (M. & B. 693), Lancet **2**:1213, 1938.

13. Molitor, H., cited by Long and Bliss,[11] p. 60.

14. Tsao, Y. F.; McCracken, M. E.; Chew, J.; Kuo, P. T., and Dale, C. L.: Renal Complications in Sulfapyridine Therapy: Report of Five Cases with One Death, J. A. M. A. **113**:1316 (Sept. 30) 1939.

In the case of our patient, the fluid intake ranged between 2,300 and 3,000 cc. daily. Despite high concentration of sulfapyridine, no evidence of renal damage was noted.

Vomiting does not occur more frequently after the administration of sulfapyridine than it does after that of sulfanilamide. Marshall [15] reported the intravenous use of a 5 per cent sodium salt of sulfapyridine. This, however, is not available for commercial use as yet. If necessary, a nasal tube may offer an excellent way of administering the drug.

Anemia of varying degrees may occur when sulfapyridine is administered in large doses. This anemia does not warrant discontinuing the use of the drug if one is dealing with a serious illness. Small frequent transfusions replace the loss in hemoglobin. Our patient received transfusions of 250 cc. of citrated blood daily for five days. Unquestionably these transfusions had much to do with the boy's recovery. Yet we were impressed by the startling improvement he showed while he was receiving sulfapyridine therapy.

SUMMARY

A recovery following thrombosis of the cavernous sinus is presented.

The details of therapy are given. Sulfapyridine was used as a chemotherapeutic agent; a total of 63 Gm. (945 grains) was administered. Excepting mild cyanosis, no subjective or objective reaction to the drug was observed.

The diagnosis of cavernous sinus thrombosis was made on both clinical and laboratory findings and is offered for inspection and criticism.

15. Marshall, E. K., cited by Long and Bliss,[11] p. 230.

A SIMPLIFIED TECHNIC FOR THE CONSTRUCTION OF LIFE MASKS OF LATEX RUBBER

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LOS ANGELES

Life masks made of latex rubber have many advantages over models composed of other materials, such as wax, plaster of paris and similar substances. Rubber models are unbreakable and unaltered by rough usage. Storage problems are simplified, as the models may be stacked high in small spaces without damage. Flexibility of reproduced features facilitates the preoperative planning of reconstructive surgical operations about the face. Mounting of these models is relatively simple and effective.

The construction of life masks of latex rubber in accordance with my technic necessitates a practical knowledge of moulage materials and of plaster of paris molds. The familiar method of constructing a plaster of paris mold directly from the subject's face has been discarded for several reasons, namely, premature separation of the rubber in the mold, due to the grease used as a separating medium on the face; loss of skin texture and detail; difficulty of modeling the defects in the resultant mold, and inadvisability of pouring plaster of paris on the subject's face while the eyes are open.

MATERIALS

A list of the materials used in my process of constructing a finished life mask in rubber follows:

1. A piece of flexible wire [1] about 18 inches (45 cm.) long for outlining the contour of the face.

2. A rigid piece of cardboard about 15 inches (38 cm.) square.

3. Thermometer, spatula and several inexpensive brushes about 1 inch (2.5 cm.) wide.

4. Commerical hydrocolloidal compound [2] for making the "negative" impression of the subject's face.

5. Plaster of paris bandages.

From the Department of Otology, Rhinology and Laryngology, University of Illinois College of Medicine.

1. Ordinary solid soldering wire is used.

2. The commercial hydrocolloidal compound employed is that known as plastico moulage. The supply used by me was furnished by the manufacturer, Technical Supply Company, Palo Alto, Calif.

6. Wax compound [3] for the wax "positive" cast.
7. Modeling clay to repair defects and trim up the wax cast.
8. Plaster of paris.[4]
9. Liquid latex rubber.

OUTLINE OF THE PROCESS

1. Constructing the "negative" impression (mold) with the hydrocolloidal compound.
2. Casting the wax "positive" (cast).
3. Modeling and correcting the defects of the wax cast with modeling clay.
4. Preparing the plaster of paris mold from the modeled wax cast.
5. Building the latex rubber "positive" cast in the plaster of paris mold.
6. Inserting the glass eyes.
7. Mounting the finished latex rubber model.

TECHNIC IN DETAIL

1. *Constructing the "Negative" Impression (Mold) with the Hydrocolloidal Compound (Moulage Material).*

A. Preparing the moulage compound.

About 5 pounds (2.3 Kg.) of the hydrocolloidal compound is melted in a 2 quart (1,890 cc.) double boiler until the material has a smooth, thick, creamy consistency. The lumps are worked out with a spatula or potato masher. One to one and a half hours is allowed for melting the moulage.

The material is cooled to approximately 110 F., and at this temperature it should just flow from the spatula to be the proper consistency for application. If the material appears too thick, small amounts of water may be added and mixed thoroughly until it flows.

B. Making the moulage "negative" (mold).

(1) Preparing the patient. No preparation of the face is necessary. The subject is placed in a comfortable reclining chair or allowed to lie supine on a table, with the chin well up, so that the neck line is smooth of wrinkles.

(2) Cutting the cardboard form. If the mask to be made does not include the ears a cardboard form is made. A soft, flexible wire (fig. 1 *A*) is passed over the vertex of the head, down in front of both

3. A commercial wax compound known as plastico posmoulage is used; this was supplied me by the manufacturer, the Technical Supply Company.

4. The plaster of paris used is a hard type known as hydrocal (a product of the United States Gypsum Co.).

ears and under the chin, the wire being shaped closely to the face. This shaped wire is outlined in pencil on a square piece of rigid cardboard. The penciled outline is cut out with a sharp knife, and the form is tried on the subject's face. It should fit snugly, but not too tightly to distort the soft parts, resting lightly on both tragi (in front of the ears). A folded towel placed over the thyroid cartilage supports the board on the neck. The hair is snugly fitted to the scalp by the shaped cardboard.

(3) Applying the moulage material. The subject's eyes may be cast open or closed. The following process describes the technic of casting with the eyes open: The first application begins in the region of the neck under the chin (fig. 1 *B*). The warm moulage material is brushed upward from the cardboard along the neck to the chin and worked over the chin to the lower lip. It is necessary to brush briskly in order to avoid the forming of air bubbles. However, the material is laid gently over the lips with no brushing in order to avoid distortion of the lip contour. The material is then brushed along the side of the face, the application of this first layer being upward always. The upward motion is essential to avoid sagging of the facial muscles because of the heavy moulage material.

In the region of the nose, the brushing may be downward over the dorsum and alae. A small size, no. 10, camel's hair brush is used to form the nostrils. The material is worked rapidly over the columellar and alar regions, some being brushed into the nares. If some of the substance accidentally obstructs breathing, two or three sharp exhalations by the subject will clear the air passages. It is important that the breathing be unobstructed, as the subject may become panicky and interfere with the work done so far.

The operator should speak reassuringly to the subject during the entire process, and communication is carried on by means of paper and pencil provided for that purpose.

The application of the moulage material about the open eyes needs special attention. The subject is instructed to stare ceilingward and cautioned about blinking for a short period. With the camel's hair brush, a thin layer is placed on the upper lid and allowed to *flow* to the eyelashes. The inner canthus next is shaped, and a heavy layer is constructed over the upper lid by repeated applications of moulage.[5]

The eyebrow is covered by allowing the material to *flow* over the hairs. *Moulage material is never brushed into hairy areas.* The opposite upper eyelid and eyebrow are treated similarly.

5. Moulage material is not injurious to the cornea; I use it regularly to make impressions (molds) of the eyeball for contact lens construction. If it is desired to cast the subject with eyes closed, the process is similar except that the moulage material is brushed gently over the closed lids.

The lower lids are covered by brushing the material to the lashes, and a thick layer is formed by repeated applications. If the subject blinks while the moulage material is still warm no harm is done, as the material will stretch a short distance and follow the lids. However, after the material has set, blinking will cause the lids to pull away, leaving behind well formed impressions.

The forehead is covered by brushing and the hair by allowing the material to flow over the surface. The desired thickness of the mold, which is approximately ¾ inch (1.91 cm.), is attained by heaping up the material over the first layer.

An electric fan is an aid in cooling and hardening the mass. When the mass has cooled, it is well to palpate over the whole surface for thin

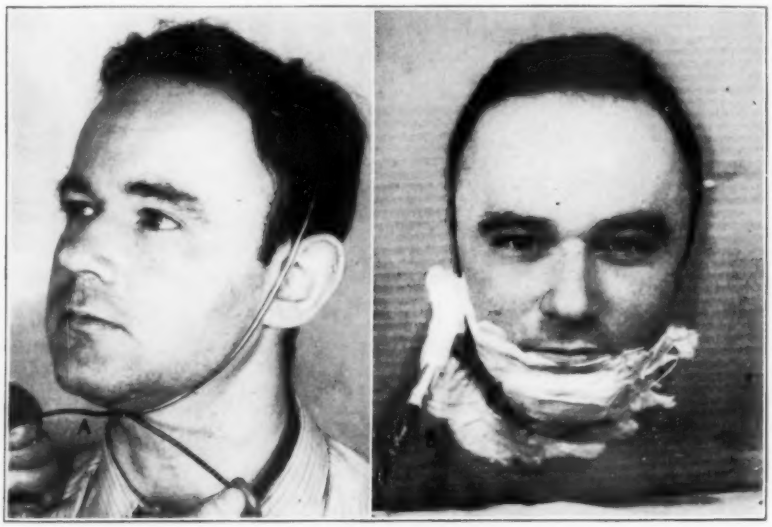

Fig. 1.—*A*, the first step in the process of casting a life mask of latex rubber made with the subject's eyes open. A soft, flexible wire is used for outlining the coutour of the face. *B*, the cardboard cut out and in place. The subject is supine with the chin elevated. The beginning of the application of the moulage material at the neck line is shown.

spots. If present, these may be reenforced by applying additional material over the areas. This new material is then cooled.

The moulage material when hardened is flexible, and a rigid support of some backing material is necessary to maintain its shape. Plaster of paris is satisfactory for this purpose and is applied in the form of bandage rolls.

(4) Preparing the plaster of paris bandages. These bandages may be purchased but can be made quite inexpensively, as follows: A roll of

crinolin, 4 inches (10 cm.) wide and 100 yards (91 meters) long, and 10 pounds (4.5 Kg.) of quick-setting dental plaster will make sufficient bandages for numerous masks. The plaster is rubbed into the crinolin mesh, about 5 foot (150 cm.) lengths being used to make up each roll. These lengths are rolled loosely and wrapped in tissue paper until ready for use. About three or four of these rolls are sufficient for one mask.

(5) Making the paster of paris shell. One of the plaster of paris rolls is laid in a deep basin of water and when the bubbling ceases is picked up by the ends and gently squeezed until the excess water is pressed out. This procedure retains the plaster in the roll.

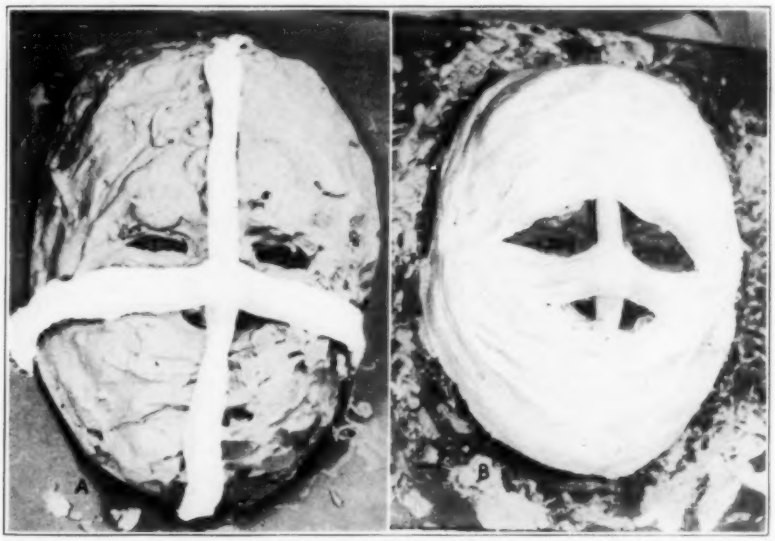

Fig. 2.—*A*, the moulage material covering the entire face has been allowed to harden. The eyes are open and the nostrils unobstructed. The picture shows the first step in the reenforcement of the mold by using plaster of paris cross struts. *B*, the entire mold reenforced by being covered with a plaster of paris shell.

The first application of the wet plaster of paris is in the form of reenforcing cross struts (fig. 2 *A*). These are constructed by cutting four layers of bandage about 1 foot (30 cm.) long from the wet plaster roll and shaping them into a thick strip about 1 inch (2.5 cm.) wide by compressing the layers between the fingers the full length of the strip. This band, or strut, is placed lengthwise on the mold, starting over the forehead area and extending down over the dorsum of the nose, columella and chin. It is shaped snugly to the contour of the nose, care being taken not to block off the nares.

A second strut, about 8 inches (20 cm.) long and 1 inch (2.5 cm.) wide, is similarly made and placed crosswise over the first one at right

angles, starting at the tip of the nasal region and being molded to the alar areas and across the face.

The shell is completed by applying the wet plaster of paris bandages around the mold, starting at the base in direct contact with the cardboard, with each succeeding layer overlapping the preceding one about one third of the width, and working upward toward the outer canthus of the eye (fig. 2 *B*). An electric fan aids in hardening the shell rapidly.

Fig. 3.—Removing the wax from the moulage mold.

(6) Removing the impression material from the face. As soon as the plaster shell is dry and hard the mold is ready for removal. The operator places one hand over the shell so that the structure of crossed struts rests in the palm and supports the mold while the subject sits up and bends forward as far as possible. The mold is allowed to come away gently while the subject moves the muscles of the face. The chin is freed first. The hair is allowed to pull away last, care being taken at this point, as the hair may be embedded in the moulage material. The mold is examined and all loose particles removed with the camel's hair brush.

2. *Casting the Wax "Positive."*

There are two methods of making the wax positive. One is to pour in the melted wax and brush and roll it over the mold. The other is to brush it in entirely. In my technic the method used is the brushing-in, as the holes in the mold left by the eyes and nares preclude pouring in the wax.

A. Brushing in the wax. The wax is melted in a *double boiler* and brushed into the mold, preferably starting at the neck line and working upward. The brushing is done rapidly and firmly to avoid air bubbles. Each succeeding brushful overlaps the last one, advancing thus over the whole mold.

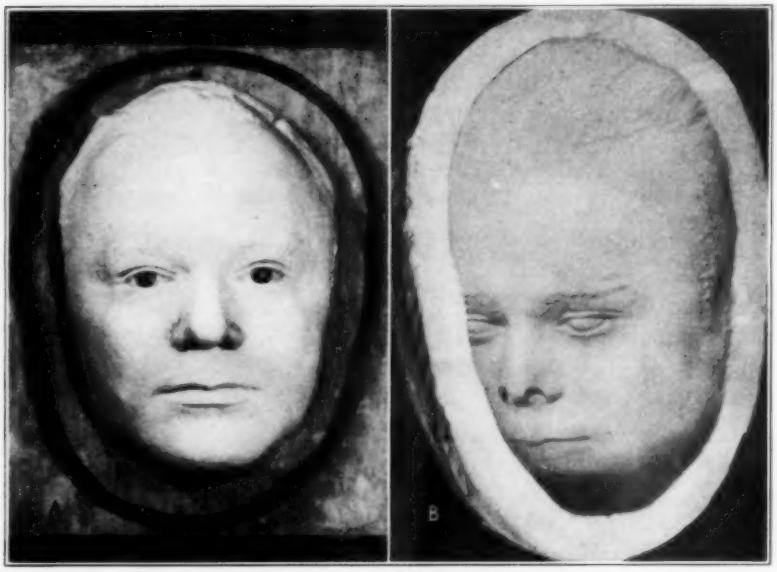

Fig. 4.—*A*, wax cast modeled and anchored to the board with modeling clay. Glass eyes have been inserted (artificial eyes may be sculptured with modeling clay if glass ones are not available). The clay dam is in place, in preparation for the making of the plaster of paris mold. *B*, the inside of the plaster of paris mold made from the wax cast shown in *A*.

B. Reenforcing the cast. After a thick layer of wax has been applied, a more rigid cast is made by reenforcing with gauze. Melted wax is brushed into the meshes of several layers of gauze laid over the first layer of wax. The finished cast should be about ⅛ inch (0.3 cm.) thick. It is cooled rapidly by allowing cold water to run gently into it and then carefully removed from the mold (fig. 3).

3. *Modeling and Correcting the Defects in the Wax Cast with Modeling Clay.*

Defects such as projections and humps are removed with a sharp knife or common wood-carving chisel. Depressed defects are remedied with modeling clay. This clay is also used for modeling the hair and improving the eyebrows. The nostrils are trimmed with a chisel.

The eyelids, upper and lower, are trimmed with a chisel and smoothed with clay. The palpebral fissures are preserved by the use of modeling clay or by fitting artificial eyes to the back of the lids. If clay is used, the eyeball contour may be sculptured with a modeling tool. If artificial eyes are used, the back of the lids may be shaped by melting the wax with an electric hotpoint and securing the artificial eyes in place with melted wax (fig. 4 *A*).

4. *Preparing the Plaster of Paris Mold from the Modeled Wax Cast.*

The modeled mask is placed on a smooth board, face up, and the edges of the mask are anchored to the board with clay. A separating medium of clear lacquer or liquid soap is brushed over the clay areas. This material has a double function. It prevents the oil in the clay from penetrating the plaster mold and in addition acts as a means of separating the clay readily from the plaster.

With the modeling clay, a small dam is constructed about 1 inch (2.5 cm.) high, encircling the mask, about an inch of space being allowed between the mask edge and the dam (fig. 4 *A*).

A hard plaster of paris [4] is employed for the negative (mold). The quantity used is determined by the size of the model. For the average-sized mask about 3 pints (1,420 cc.) of water is poured into a large basin and the dry plaster of paris is sprinkled over the water by handfuls until small heaps of dry plaster remain on the surface of the water. It is customary to wait three minutes to allow the plaster to soak thoroughly and then stir rapidly with a spoon or with the hand until a fine, lumpless mixture is formed. When the mixture begins to set and is the consistency of thick cream, it is picked up in a cup and poured over the features, the mixture meanwhile being brushed well into the hair, eyes, nostrils and all crevices with the camel's hair brush.

A good deal of the plaster mixture will flow off into the gutter made by the clay, but it must be continually played over the features until a thick shell is formed, extending about 1 inch (2.5 cm.) over the highest point, which is the nasal tip. A flat surface is made on the top of the shell with the spatula so that the shell will remain level when turned up.

When the plaster has set, the shell is lifted from the board and turned over and the wax model removed. The heat generated while the plaster is setting softens the wax, making it pliable and easily removable with gentle manipulation. Any wax which remains firmly adherent may be floated off by allowing a stream of hot water to play over this area in the plaster mold.

Defects in the plaster of paris mold, such as air holes and broken areas, are repaired at once with a fresh plaster of paris mixture and a camel's hair brush. The completed mold is shown in figure 4 *B*.

5. *Building the Latex Rubber "Positive" Cast in the Plaster Mold.*

The plaster mold is thoroughly dried on a hot radiator or in an oven kept at approximately 150 F., with the oven door slightly open. Grease or oil is detrimental to the rubber cast, causing the rubber to pull away from the plaster, and therefore should not come in contact with the face of the mold.

Fig. 5.—Rubber model removed from the mold shown in 5 *B*, mounted on a board, untinted. The palpebral fissures are intact.

Latex rubber is a thin white liquid and is applied in the following manner: An inexpensive brush about 1 inch (2.5 cm.) wide is prepared by dipping the bristles in soapsuds and then squeezing the excess off between the fingers. This facilitates the cleansing of the rubber-soaked brush after use. The liquid latex is brushed into the mold briskly, all bubbles being worked out and a thin, smooth layer of rubber being left on the surface of the negative. The first coat is allowed to dry (air vulcanization) thoroughly before the succeeding layers are applied. It takes about fifteen minutes to one-half hour to vulcanize in a warm room and less time in an oven at 150 F.

The oven temperature should never exceed 150 F., as the excess heat may cause the water in the rubber to vaporize, thus making the rubber

peel from the plaster. Succeeding coats are applied after each preceding coat has dried thoroughly.

After the fifth or sixth layer has been applied, the model is reenforced with gauze. A full thickness (8 ply) is placed evenly over the whole surface of the mold (except in the region of the palpebral fissures), and then the liquid rubber is brushed into the meshes of the gauze. No gauze is laid over the palpebral fissures, as these areas are to be cut out when the glass eyes are inserted and therefore should remain thin. The gauze layer is allowed to vulcanize approximately twenty-four hours (air vulcanization) before the final layer of rubber is brushed over the entire mold. When this last layer has dried, the rubber model is removed from the plaster.

Fig. 6.—The rubber model (left), in which glass eyes have been inserted and which has been tinted and mounted on a board. The finished model is shown in comparison with the subject.

Removal of the rubber model is done gently to avoid breaking off the projecting plaster nares. Small portions are stripped away from the plaster at a time until the whole model is free, and it is then removed (fig. 5).

6. *Inserting the Glass Eyes.*

The thin diaphragm of rubber in the palpebral fissures is cut out with sharp scissors. The artificial eyes (color of iris matching the subject's) are manipulated in each socket until they are fitted accurately and the eyes appear straight. The socket may have to be trimmed with scissors or built up with liquid rubber to fit the flat artificial eye. Each eye, when properly alined, is held in place temporarily with adhesive

tape, and liquid latex is painted around the points of contact between the glass and the rubber socket and is allowed to vulcanize in place.

Artificial eyelashes [6] may be attached by cutting a deep groove along the full length of the upper lid with a sharp knife or a razor blade, keeping as close to the edge as possible. The base of the eyelash is inserted with a needle and anchored in place by applying a thin layer of liquid latex over the cut edge of the eyelid. The lashes in the lower lids may be painted in with a fine camel's hair brush and an appropriate color.

7. Mounting the Finished Latex Rubber Model.

Tinting of the models is accomplished with an air brush and special lacquers. This process is involved and will not be described in this paper. However, the untinted model may be mounted with pleasing results (fig. 5). This mounting is accomplished by trimming the thin projecting edge of rubber encircling the base of the model to a width of about ½ inch (1.3 cm.) and then, with ordinary small tacks, securing the projecting edge to an inexpensive breadboard.

A comparison of the finished model with the subject is shown in figure 6. The rubber model (left) has been tinted, and the glass eyes and artificial eyelashes have been inserted.

SUMMARY AND COMMENT

An economical method for the preparation and preservation of life masks made of latex rubber is described.

To any one doing plastic surgical procedure it is a valuable asset for preoperative planning and for record purposes.

This process has been taught as a part of postgraduate instruction in the department of otology, rhinology and laryngology of the University of Illinois College of Medicine for the past two years, and great interest has been evidenced when this material has been exhibited.

Latex rubber models have proved an excellent medium for instructional purposes in that department.

Knowledge of the preparation of life masks is the basis for the construction of prosthesis (rubber), a field in which the department has pioneered for the past fifteen years.[7]

Dr. Francis L. Lederer and Dr. Noah Fox gave me encouragement and inspiration in this work.

710 South Union.

6. Artificial eyelashes may be purchased in any cosmetic shop.

7. Lederer, F. L.: Prosthetic Aids in Reconstructive Surgery About the Head, Arch. Otolaryng. **8**:531 (Nov.) 1928.

Case Reports

LYMPHANGIOMAS OF THE TONGUE

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Enlargement of the tongue may be produced by various processes. Among those of noninfectious and nonmalignant nature the lymphangiomas represent a group of special interest and significance. They are not frequent, and various details of their occurrence and pathologic nature are still veiled in darkness. Every new report about such tumors is of importance and apt to make members of the medical profession more familiar with the nature of this growth.

The first pictured description of a clinical condition of this type is found in Virchow's article (1854) [1] "About Macroglossia and Pathologic New Formations of Striated Muscle Fibers," in which he showed that this type of enlargement is not a hypertrophy of the muscle tissue of the tongue as former authors thought and laid the basis of modern pathologic, anatomic and histologic knowledge of these tumors of the tongue.

Much of Virchow's description is still valid today; in some details knowledge has been enriched and somewhat changed by later investigators.[2] The mode of development of the tumors is still discussed; the most accepted theory is that the primary growth is a new formation of lymph vessels from a congenital anlage; another theory is that lingual lymph spaces become dilated, especially under the influence of inflammatory processes, and then penetrate more and more the surrounding tissue. It is of interest to note that the formations show, in the oral cavity, a predilection for places where in the embryologic development fissures were present and subsequently were closed. They are often noticed in childhood but remain small for a long time and then suddenly are exacerbated, usually as the result of an inflammatory process, after dentition or before puberty. Superficial trauma may bring about infection of the whole cavernous system of the growth. After such infectious attacks the tumor does not recede at all or only partially recedes, so that during life the tongue becomes bigger and bigger. The characteristic detail in the clinical picture of this enlargement is the granulating surface, which is formed by smaller and larger vesicles filled with fluid.

Today these formations are divided into three types.

From the Eye, Ear, Nose and Throat Clinic.

Presented before the Colorado Otolaryngological Society, Denver, Sept. 30, 1939.

1. Virchow, J.: Ueber Makroglossie und pathologische Neubildung von quergestreiften Muskelfasern, Virchows Arch. f. path. Anat. **7**:127, 1854.

2. Mikulicz, J., and Kümmel, W.: Die Krankheiten des Mundes, Jena, G. Fischer, 1922. Spencer, W., and Cade, S.: Diseases of the Tongue, Philadelphia, P. Blakiston's Son & Co., 1931. These books contain a complete bibliography.

1. The nodular or wart-shaped lymphangioma, which, in the form of smaller and larger tumors, is elevated above the surface of the tongue, mostly on the margin and on the base, and gives the appearance of hypertrophy of the papillae of the tongue, but when the growth is exactly examined with a loop the vesicles mentioned are discernible.

2. The diffuse lymphangioma, the real "macroglossia," which also shows the characteristic small vesicles but in which, from these vesicles, not isolated little masses but the affected part of the tongue as a whole is diffusely enlarged.

3. The cystic lymphangioma, or the lymph cyst, mentioned only to complete the picture, which represents a great rarity and consists of one big lymph cavity which is regarded as a lymph cyst.

Every tumor, as already mentioned, has its own peculiarities, brings out new details and more fully completes the knowledge of this interest-

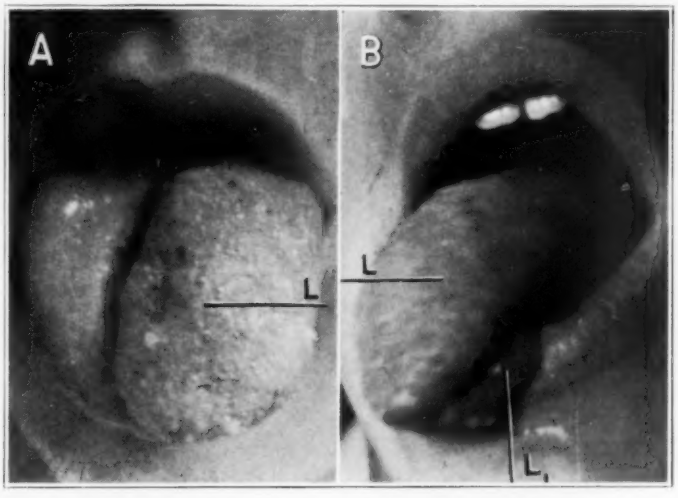

Fig. 1.—Diffuse lymphangioma of the tongue. *A*, view from the front; *L* indicates the main tumor. *B*, view from the side; *L* indicates main tumor and L_1 the second tumor.

ing formation on the tongue. In the following case reports observations and findings are presented which will enhance knowledge concerning types 1 and 2.

REPORT OF CASES

CASE 1.—A youth, B. St. J., aged 18, reported to the office with the following history: At the age of 5 years he bit his tongue, and the lesion looked like a blood blister for a while. It improved somewhat, but he again bit his tongue, which grew slowly until it showed its present size and shape. This picture had persisted for the past four or five years without any appreciable change. The whole tumor seemed to have first started under the tongue and only later on had spread over the upper surface of the tongue. The patient did not feel any discomfort when eating, and the condition did not bother him in any respect.

The tongue (fig. 1 *A*) represented an impressive picture. Two distinct areas appeared on the upper surface. On the right half was the normal surface of the

tongue, showing no pathologic change; the left half was elevated high above the normal right part and consisted of harder and more elastic tissue. The left part had rough granulations of the surface, which, as was to be recognized with the naked eye and, still better, with the loop, were caused by innumerable small vesicles, the contents of which were partially clear, partially opaque and partially blue-reddish. On several places furrows or prints of the teeth were imprinted, and yet on others—in the picture beside the middle line—the epithelium seemed

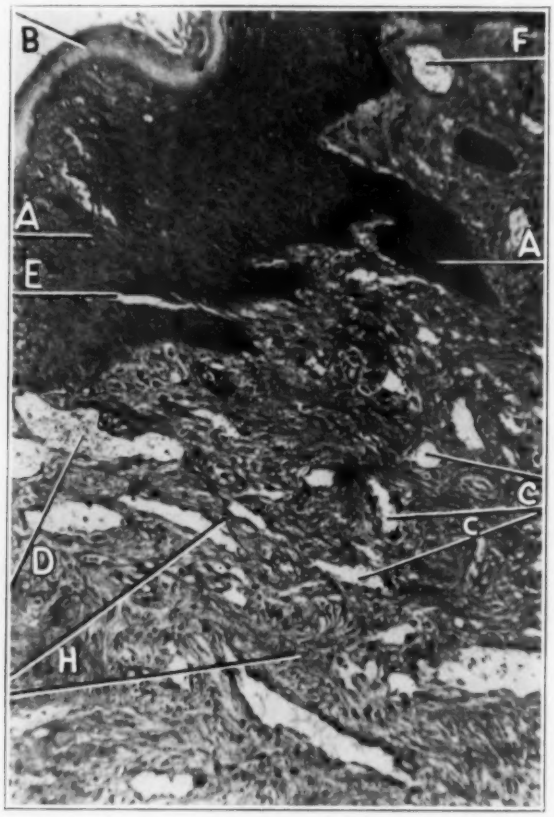

Fig. 2.—Vertical section through the epithelium, the subepithelial layer and the substance of the tongue. *A* indicates the epithelium; *B*, the cornified layer; *C*, the lacunas; *D*, a group of communicating lacunas; *E*, a lacuna in the epithelium; *F*, a subepithelial lacuna, and *H*, the septums of connective tissue between the lacunas.

to be lacking. The whole left part of the tongue was considerably enlarged. The tissue which caused the enlargement was sharply limited against the middle of the tongue; it reached backward to the circumvallate papillae, immediately beyond which was normal tongue tissue again. The same rather sharp delimitation at the margin was noted along the lateral edge.

However, a most interesting observation was made on lifting the tongue: Independent and separated from the one described by a zone of normal tissue at the lateral margin of the tongue, another, smaller, mass was to be seen under the

tongue to the left of the frenulum (fig. 1 *B*). It ran obliquely from below the left margin down toward the frenulum. It had the same appearance as the main tumor but was separated from it by normal tissue at the lateral margin of the tongue and had no connection with it.

The diagnosis was not difficult after these details had been observed. The condition was diffuse lymphangioma. The patient had no particular discomfort at that time, was satisfied with his condition and refused any specific treatment.

Case 2.[3]—A 66 year old patient had noticed, supposedly only three weeks previously, a spot on the tip of the tongue which bled easily. At the time of the examination a whitish granulated and lobulated mass of about 1 cm. in diameter

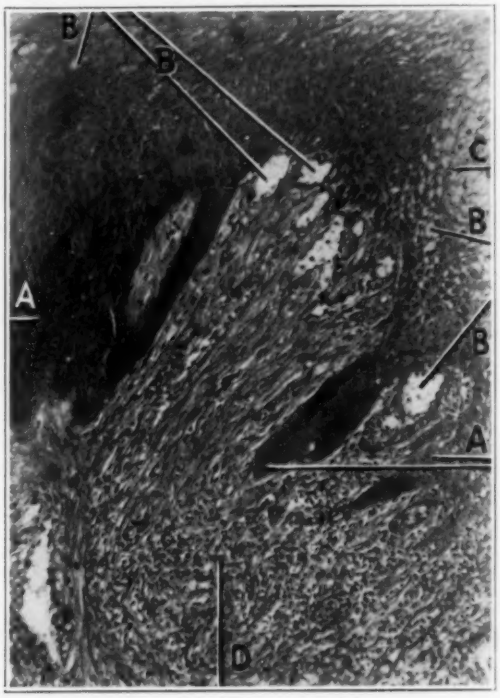

Fig. 3.—Advancing of the lacunar tissue against and into the epithelium. *A* indicates the epithelium; *B*, the lacunas; *C*, a meshwork of epithelium, and *D*, leukolymphocytic infiltration.

which did not bleed existed at the tip of the tongue. Treatment was surgical removal with the area under local anesthesia.

In this case also the clinical diagnosis was not difficult. The tumor was similar to that in case 1 but differed from it in its localization, size, consistency and appearance. The characteristic granulated surface was caused by the formation of vesicles. The condition may be classified, after what we have said, as node-shaped lymphangioma of the tongue.

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3. The second case is reported by permission of Dr. W. C. Black, Head of the Department of Pathology of the University of Colorado School of Medicine.

Complete explanation is brought about by the microscopic examination, which, on account of the interest which the case presents, will be discussed in detail. A section into the tumor vertical to the epithelium of the tongue (fig. 2) shows at this site the epithelium intact but hypertrophic, irregular and cornified. Below it, in the subepithelial layer and in the substance of the tongue, where the muscles of the tongue are to be expected, a tissue is to be seen which is characterized by vast numbers of lacunas. These lacunas, which prevail in the picture, extend subepithelially, close to the epithelium and in some places into the epithelium itself. In other places, figure 3 for example, the subepithelial cavernous tissue grows between the hypertrophic processes of the epithelium into the epithelium, and the epithelium itself becomes spongy, the layers in a way loosening themselves, so that an interepithelial meshwork arises with innumerable small cavities, which almost reach to the surface.

The lacunas of the cavernous tissue (fig. 4) show various shapes and sizes, round, oval or slit-shaped. But they all show essentially the same fundamental structure: They have a thin wall and are covered inside by a one-celled row of endothelial cells (fig. 5). These cavities are in some places rare; in others, extremely numerous; they may be confluenced and then spread out in labyrinthine nature. The lacunas are separated by septums of various widths, consisting of connective tissue fibers and sometimes slightly edematous tissue, which, accidentally depending on the inflammatory condition on the surface, show leukolymphocytic infiltration, and seldom a muscle fiber is to be seen.

Of interest are the contents of the cavities, which figure 4 exemplifies. They are not uniform but unique in their variances. Besides sporadic empty ones, a majority containing a homogeneous fluid is to be observed; others in addition to the fluid contain a few lymphocytes, and, finally, some, but fewer, contain blood with all its constituents, red and white blood cells.

These lacunas are in their structure and contents identical with the ones first described by Virchow and regarded as lymph vessels. The entire formation, therefore, according to this histologic observation, is to be classified as lymph vessel tumor or lymphangioma.

COMMENT

The findings allow the following comments:

1. The diffuse lymphangioma could be traced in our case to early youth, which fact speaks more for a congenital anlage. A traumatic or inflammatory basis is to be ruled out in both cases, for neither clinically nor microscopically are any inflammatory signs to be proved.

2. For the first time occurrence on two separate areas, or double occurrence, of lymphangioma is described, without a visible macroscopic relation between the two tumorous areas (case 1). This finding speaks for a common congenital origin of both tumors, not inflammatory in nature.

3. The occurrence of two different lymphangiomas on the same tongue gives especially interesting information on the favorite site for the development of this tumor.

The tongue develops in the third embryonal week from an anterior anlage coming from the mandibular arch, from bilateral thickenings and from a posterior paired anlage from both hyoid arches. The line of fusion between the anterior and the posterior anlage is marked in the adult by a V-shaped furrow along the line of the circumvallate papillae, in the apex of which lies the foramen caecum. It is now extremely

interesting that both lymphangiomas of the same tongue were lying within the limits of such fissures in the embryonal development beyond which they did not extend. The large main lymphangioma of the first case was limited medially by the central line of fusion between the two

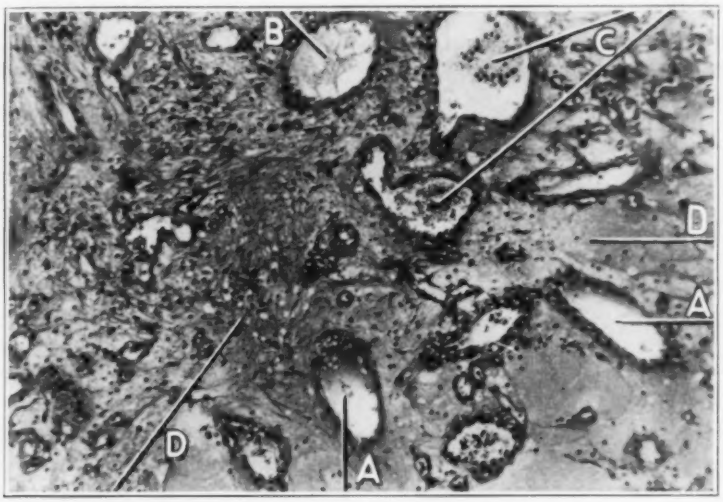

Fig. 4.—Lacunas and their contents. *A* indicates a lacuna filled with serous fluid; *B*, a lacuna filled with serous fluid and some lymphocytes; *C*, a lacuna filled with red and white blood cells, and *D*, the septums between lacunas.

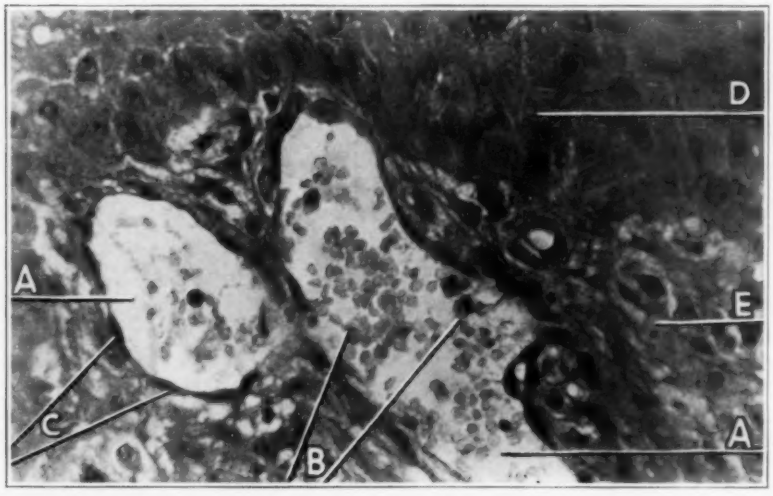

Fig. 5.—Lacunas under higher power. *A* indicates a lacuna; *B*, red and white blood cells; *C*, the wall (endothelial cells); *D*, the epithelium, and *E*, the interlacunar tissue.

thickenings of the anterior anlage and posteriorly by the embryonal fissure between the anterior and the posterior anlage of the tongue. While it spread slowly against the latter, the mass ended sharply at the former, with overhanging walls. The same was true of the small mass on the inferior surface of the tongue. It also originated from the central line of the tongue, like the superior one, but remained smaller and did not extend farther posteriorly. It must be assumed that there is some developmental arrest along the border of the embryonal tissue of the arches, which is dormant and then sometime during life takes on the peculiar lymph vessel change, forming lymphangiomas and specifically confined within definite boundaries. This observation of a double lymphangioma on the same tongue significantly supports the theory of the fissural development of lymphangiomas and of their embryonal origin.

4. The lymphangiomatous tissue substitutes the normal lingual tissue; the enlargement of the affected areas of the tongue, i. e., the macroglossia, is not brought about by hypertrophy of the lingual muscle fibers but, as Virchow previously stated, by augmentation and dilatation of the cavernous lacunas. In substantiation of this evidence muscle fibers are mostly absent or rare in the affected areas; they have become atrophic and have practically disappeared from this part of the tongue.

5. The lacunas in the cases described are filled partially with lymph and partially with blood, so that the name "hemolymphangioma" would be justified. About the development of the blood in these lacunas there are divergent opinions. While some authors assume that there is a new formation of blood vessels in such growths, others are of the opinion that there is secondary filling of the cavities with blood by erosion of blood vessels the walls of which have been thinned by the growing lymphangioma and which break through during a traumatic insult or one of the inflammatory attacks. The blood, according to the latter conception, then fills some of the dilated lymph-vascular areas. Our findings speak for the latter assumption; in none of the sections were larger blood vessels to be seen; the cavities were histologically almost without exception dilated lymph vessels, and even those which were filled with blood did not look different from the others. They were enlarged lymph vessels into which blood vessels must have eroded secondarily.

The diagnosis of these tumors, after what has been described, is confirmed or supported by the macroscopic picture of the blisters and the microscopic picture of the lacunas. In the differential diagnosis sometimes a malignant tumor could be considered, but such a growth is easily differentiated from lymphangioma by the history, the course, and the histologic examination.

The prognosis is mostly good; however, the frequent injuries to which the enlarged tongue is exposed cause a permanent danger of infection, which, even with apparent freedom from symptoms, as in our first case, makes treatment advisable.

The therapy of choice is radical excision if one is dealing with small, circumscribed tumors; with extensive, diffuse tumors the entire mass cannot be removed, but it is possible, by a combination of several

excisions of wedge-shaped sections of tissue, in different directions, to reduce the tongue so much that it has space in the oral cavity. Igni-puncture and radium therapy for such tumors have not proved as successful as they have for those of the blood vessel type.

SUMMARY

The clinical and histologic picture of lymphangioma of the tongue is illustrated by the presentation of 2 cases, and on the basis of the observations a contribution is furnished to the knowledge of the origin and pathogenesis of this tumor.

OTITIS EXTERNA DIFFUSA ASSOCIATED WITH SECONDARY ANEMIA

JOHN E. ALEXANDER, M.D., ARLINGTON, VA.

While I hesitate to report on a clinical entity commonly encountered by otolaryngologists, I feel that since I learned something from these cases, they are worth at least a passing comment.

REPORT OF CASES

CASE 1.—A 28 year old white woman complained of pain in the right ear and in the postauricular region. The bony portion of the canal of the right ear was uniformly beefy red; the drum, while slightly red, was thought to be normal, as was borne out by further clinical tests. The patient was given local treatment, such as the application of packs wet with cresatin-Sulzberger (metacresylacetate) and the exposure of the affected regions to heat. There was immediate improvement, but after several treatments the original condition recurred. After about six weeks of painstaking treatment, including the administration of a Staphylococcus aureus and Staphylococcus albus vaccine, the condition was about the same. The patient suggested that she might be anemic; after a cursory examination of her conjunctivas I thought her suggestion good. I referred her to her family physician, who reported as follows: hemoglobin 60 per cent and red blood cells 3,000,000. When questioned as to the cause of the condition of the blood, the physician replied that she did not know it although she had tried to find out; the diet was normal; the menstrual history was not unusual, and the patient was not suffering from any other pathologic condition. At any rate, after two injections of liver extract and discontinuance of local treatment, the condition began to improve and promptly disappeared. There has been no recurrence to date, after an interval of four months.

CASE 2.—A 12 year old white boy complained of pain in the left ear and swelling of the glands of the neck. Examination revealed a large furuncle near the external auditory meatus on the lower wall. This was promptly incised and drained. A moderate amount of frank pus was obtained. This condition subsided. Two days later the patient returned, complaining of the persistence of pain. The incised furuncle was well on the road to recovery, but the skin over the bony portion of the canal was diffusely red and exquisitely tender; hence a diagnosis of otitis externa diffusa was added. Local treatment was employed for a few days and the furuncle disappeared, but the diffuse inflammation of the canal grew worse. Without waiting for the patient to suggest it in this instance, I referred him to a general practitioner, who reported secondary anemia, with a hemoglobin content of 60 per cent and a red blood cell count of 3,000,000. This proved to be a nutritional type of secondary anemia. After five days of oral administration of liver extract the condition had disappeared and has not recurred in three months.

CASE 3.—A 68 year old white woman presented herself, complaining of pain in both ears of three days' duration, and gave a history of an inflammation of both aural canals one year previously that lasted one month with recurrences. Both canals were diffusely red, especially over the bony portions. I finally per-

suaded the patient to have a blood count done, although she remonstrated that she had recently had a general check-up and that if she had had anemia her doctor would certainly have detected it. Her report came back, "very mild secondary anemia," with a hemoglobin value of 70 per cent and a red blood cell count of 3,000,000. At any rate, the patient was given a course of treatment with liver extract by mouth as well as the usual local therapy. The condition subsided in one week and has not appeared since, after an interval of three months. This patient, according to symptoms and signs, had by far the worst involvement of the three. The anemia in this patient was most probably also of the nutritional type.

CONCLUSION

While the local treatment for this disease is fairly well standardized, I wonder if some of the more protracted or obstinate examples might not be traceable to relatively mild secondary anemia. At least, judging from my own meager experience, I want a red cell count and a hemoglobin determination made in my future cases of otitis externa diffusa.

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Clinical Notes; New Instruments and Technics

A POSITIVE METHOD FOR ABLATION OF SEPTO-TURBINAL SYNECHIAE

CHARLES FIRESTONE, M.D., SEATTLE

Adhesions arising between the nasal septum and the turbinate bones are ordinarily the result of trauma, operative or otherwise. On rare occasions ulcerative lesions arising in the course of systemic diseases produce synechiae. It is my experience that of those adhesions occurring as a result of trauma, the postoperative are the most common. Owing to the turgescence of the lower turbinate bones and the increased width of the septum at its base, narrowing the nasal channel in that location, synechiae often occur between these two structures after operative procedure. One not infrequently, however, encounters adhesions higher, in the region of bony septal spurs, and between the septum and a bullous middle turbinate. The usual history in the latter cases is that a diagnosis of sinal disease had been made and the area subjected to instrumentation, operative or applicative.

Synechiae, per se, while constituting abnormal structures, are harmless as structural pathologic entities. They, however, produce symptoms of which the patient is conscious. To the patient they give the feeling of the presence of something foreign in the nasal chamber. This feeling is imparted to him by contact of two areas normally separated. He at times interprets them by his complaint of the feeling of a foreign body in the nasal channel, even if these adhesions are small. According to the extent of the adhesions the patient experiences a lesser or greater sensation of fulness in his nose, which blowing only partially relieves, and the symptom complex of obstructed sinal drainage with its attendant train of symptoms, the severity of which is more or less directly proportional to the location and extent of involvement. In the region of these synechiae one generally finds an accumulation of mucus, sometimes viscid and free and sometimes adherent to the synechiae by the crusting of the layer adjacent to the scar tissue forming the adhesions.

For some reason, the treatment of synechiae has not received adequate attention in rhinologic textbooks. If the subject is mentioned at all, the treatment advised is separation of the adhesions with subsequent applications of ointments or other medicaments, in an effort to keep the tissues from reestablishing contact and ultimately readhering. In my cases this method of treatment has always required prolonged observation, and the results have often been unsuccessful. Each office visit necessitates an application of medicaments, and these applications tend of themselves to induce factors favorable to the reestablishment of the adhesion, as they disturb the healing processes.

In consequence of these experiences, I have devised a procedure which in my hands has shortened the period of treatment and proved wholly successful. The procedure follows:

The nasal chamber to be operated on is thoroughly anesthetized by the topical application of a 5 per cent solution of cocaine hydrochloride to which 15 drops of epinephrine hydrochloride to the drachm (3.88 Gm.) has been added. Into the septal and the turbinate adhesive area is then injected a 1 per cent solution

of procaine hydrochloride and epinephrine hydrochloride (epinephrine hydrochloride 10 drops to the ounce [30 cc.]) for a considerable distance beyond their borders, injection into each of these areas being made separately. The adhesion is then severed close to the septum, the eschar being left adherent to the turbinate mucosa. The eschar, together with a crateriform portion of the mucosa, is completely excised from the turbinate mucosa. This crater is then curetted all the way down to the turbinate bone so as to produce an elliptoid crater, the longer axis of which is in a vertical position. Next, the mucosa is undermined sufficiently to allow loosening and approximation of the mucus-surfaced lips of the prepared elliptic crater, and is sutured. This produces a linear scar in place of the original irregular scar and of the elliptic one resulting from the operation. This linear scar is vertical as a result of the elliptoid craters, having been prepared vertically.

I have not always found it possible to obtain a sufficient flap on the septum, as the septal mucosa is thinner and more taut. The septal scar, therefore, becomes an individual problem, and is repaired by flap if it is feasible; when this is not feasible, it is left to heal, as described later. In the case of a bony spur, I separate a flap of the mucosa, excise the scar and by submucous resection remove the spur and then lift the flap, to cover the denuded area. If sufficient mucosa has not been obtained by this procedure, a portion of the bony maxillary crest of the septum is removed after the mucosal flap has been separated, and approximation is thus obtained. This flap is always cut horizontally with a view to having the resultant linear scar at cross angles to the linear scar on the opposing turbinate bone. The linear scars obtained should, theoretically at least, touch at only one point. This procedure is not always practical and, indeed, in my hands not feasible for some septal locations. When this is the case, the septal scar is not interfered with, but is allowed to heal. In instances in which the synechia is between the middle turbinate bone and the septum, the synechia is separated close to the septum, and the mucous covering of the middle turbinate bone undermined and the bony middle turbinate bone crushed, if necessary, to obtain laxity and reapproximation of the mucous edges.

The procedures described so far would be, in my opinion, in themselves an improvement over discission of the synechiae and subsequent medicamentary application as generally practiced, even if this discussion were to stop here. However, these methods will not succeed in every case, as smaller punctal readhesions may form. The desideratum is to keep the two formerly adherent surfaces separated during the healing. Complete nasal packs are cumbersome and not well borne, for this period, and partial packs have a tendency to move about or be dislodged from the location for which they are intended.

I accomplish this separation by introducing into the nasal channel a thin piece of celluloid to both sides of which has been applied a 5 per cent boric acid ointment. It is of sufficient length and height to insure its keeping the two formerly adherent areas separated during the healing. It rests on the floor of the nasal channel. It must be big enough to intervene completely between the two repaired surfaces, even when it is displaced by shifts in body position and by nose blowing. It is retained in the nose for three weeks, during which period it is inspected twice weekly, removed, cleaned and reshaped if necessary. The septal and the turbinal wound undergo complete healing in this period, and chances for the recurrence of the synechiae are completely eliminated.

When I find it impractical to produce a linear scar as outlined, I sever the synechia close to the turbinate bone, allowing the eschar to adhere to the septum. I then remove the eschar close to the septal wall and introduce the celluloid strip.

If the synechial area is extensive, preliminary packing may be necessary. The introduction of the separating celluloid strip may then have to be delayed twenty-four to forty-eight hours.

CONCLUSIONS

1. The treatment of septoturbinal synechiae by merely severing them is inadequate.

2. The procedure of excision of the eschar and production of linear scars at cross angles to each other by means of flaps is the desideratum, as it reduces the chances for readhesions to form.

3. The introduction of a medium that separates the hitherto adherent areas and the retention of that medium during the healing render the reforming of synechiae impossible.

1433 Medical-Dental Building.

Progress in Otolaryngology

Summaries of the Bibliographic Material Available in the Field of Otolaryngology

PERORAL ENDOSCOPY

LOUIS H. CLERF, M.D.
AND
F. JOHNSON PUTNEY, M.D.
PHILADELPHIA

BRONCHOSCOPY

Anatomy of the Bronchi.—With recent advances in the knowledge of pulmonary diseases and with the necessity for correlating of findings by the roentgenologist, the internist, the bronchoscopist and the thoracic surgeon, there is need for a more comprehensive description of the structure of the bronchi, particularly for one which will permit visualization of their distribution to the pulmonary tissue. There has been some confusion due to different interpretations of nomenclature by different writers. Neil, Gilmour and Gwynne [1] said they considered it important to recognize as different entities those branches which supply separate pulmonary segments and which bear a different relationship to the chest wall. Instead of designating them tertiary bronchi they suggested the term segmental bronchi. There appears to be no reason, either anatomic or clinical, for subdividing a main bronchus into two or more parts. Anatomic and clinical recognition is readily established on the basis of the bifurcation and the openings of the various vestibules and branches. There is no practical use in giving names to the subdivisions beyond the segmental bronchi. A list of the segmental bronchi and the larger subdivisions in the sequence in which they leave the tracheobronchial tree is given.

Acute Laryngotracheobronchitis.—In a report of 6 cases of acute infective laryngotracheobronchitis, Font and Ortiz [2] recorded the clinical progress of the patients. Three died. Staphylococcus aureus haemolyticus was found in all 3 instances. The behavior in their cases was not unlike that noted in cases of infection produced by Streptococcus

1. Neil, J. H.; Gilmour, W., and Gwynne, F. J.: The Anatomy of the Bronchial Tree, Brit. M. J. **1**:495 (March 11) 1939.

2. Font, J. H., and Ortiz, A.: Acute Infective Laryngotracheobronchitis in Puerto Rico, Puerto Rico Health Bull. **3**:109, 1939.

haemolyticus. The onset commonly was unassociated with any previous acute infection of the upper respiratory tract, and the patients did not seem ill until the appearance of croup, cough and dyspnea. Therapeutic procedures indicated are the following: maintaining an adequate airway, combating dehydration and keeping the patient's resistance at the highest possible level.

Three cases of acute laryngotracheobronchitis in which recovery occurred were reported by Evans.[3] In 1 the condition was due to Str. haemolyticus and in the remaining 2 to Staph. albus. In the cases of staphylococcic infection, bacteriophage was instilled into the trachea at frequent intervals and soon removed by suction. Each instillation of the fluid induced a paroxysm of coughing with expectoration of quantities of thick, viscid purulent secretion. Other important essentials in the treatment of these patients were: constant and competent special nursing, humidification of the air, maintenance of an adequate airway by tracheotomy, frequent aspiration of secretion through the cannula and bronchoscopic removal of crusts when indicated.

Difficulty in maintaining an adequate airway in cases of acute laryngotracheobronchitis, even after tracheotomy, commonly results from obstruction of the trachea and bronchi with thick or inspissated secretions. In Cassidy's [4] case, tracheotomy, the employment of an oxygen tent, humidification of the air, intratracheal instillation of saline solution with ephedrine and aspiration through the tracheal cannula were not effective, and the bronchoscope was resorted to for removal of obstructing crusts. A total of 37 bronchoscopic aspirations were performed over a period of thirteen days. The patient made a complete recovery.

The treatment of acute laryngotracheobronchitis was discussed by Galloway,[5] who reported 10 cases of this infection in which cannulation was required, in 2 of which death occurred. He stated the opinion that the fatal termination is due to cardiac and general exhaustion which occur after the bronchial tree has been blocked by edematous and inflammatory mucosa, with thick adherent secretions producing atelectasis. Early tracheotomy and bronchial aspirations are indicated, and as an adjunct postural drainage has proved especially valuable. With the head of the patient lowered the bronchial lumen is kept free of secretion and plugs by the use of suction applied by a catheter through the trache-

3. Evans, M. C.: Acute Laryngotracheobronchitis: Report of Three Recovered Cases, Ann. Otol., Rhin. & Laryng. **48**:216 (March) 1939.

4. Cassidy, W.: Acute Laryngotracheobronchitis, Arch. Otolaryng. **29**:857 (May) 1939.

5. Galloway, T. C.: Postural Treatment of Acute Laryngotracheobronchitis, J. A. M. A. **112**:1566 (April 22) 1939.

otomy tube. In the cases reported, instillation of a warm sodium bicarbonate or epinephrine solution removed obstructing crusts satisfactorily.

Laryngeal Stridor.—In a study of 30 case histories of infants with stridorous breathing, Bowman and Jackson [6] found supraglottic obstruction to inspiration due to deformity or flaccidity of the epiglottis, arytenoids and aryepiglottic folds. Although 21 infants were reported, on the basis of roentgen studies, as having some enlargement of the thymus gland, only 5 were definitely improved by roentgen therapy. In 3, there was found congenital malformation of the larynx. Satisfactory study of a child with stridor should include roentgen examination of the neck and chest in both planes and an endoscopic examination of the larynx and trachea.

Anesthesia.—Endoscopic procedures may be satisfactorily performed with a minimum of discomfort if there is adequate anesthesia. Putney [7] outlined the technic of administering local anesthesia for peroral endoscopic procedures. He expressed preference for topical applications of pontocaine hydrochloride, 1 per cent, to the piriform sinuses and for instillation of larocaine hydrochloride, 2 per cent, into the larynx and trachea. The importance of the time element, of the amount of solution used and of placing the medication in the desired locality was stressed. In treating laryngeal conditions it is desirable to fractionate the dose. Sedatives are valuable aids and should be used for all diagnostic bronchoscopic examinations and for bronchoscopic removals of foreign bodies. Children tolerate large doses of morphine remarkably well.

Indications for Direct Laryngoscopic Procedure.—In a discussion of the indications for direct use of the laryngoscope, Jackson [8] referred briefly to the early contributions in the development of this procedure. Direct use of the laryngoscope affords the only means of examining the larynx of infants and young children. The presence of symptoms referable to the larynx of a child is therefore an indication for a direct laryngoscopic procedure for diagnosis and often for treatment. The adults for whom direct examination is indicated are those in whom the larynx cannot be visualized properly by mirror laryngoscopic examination and those requiring additional instrumental manipulation, such as removal of tissue for biopsy, removal of a growth or foreign body and dilation. Benign and malignant growths, vocal nodules, contact ulcer,

6. Bowman, J. E., and Jackson, C. L.: Chronic Stridor in Infancy, J. Pediat. **15**:476 (Oct.) 1939.

7. Putney, F. J.: Anesthesia in Peroral Endoscopy, Laryngoscope **49**:55 (Jan.) 1939.

8. Jackson, C. L.: Indications for Direct Laryngoscopy, Ann. Otol., Rhin. & Laryng. **48**:926 (Dec.) 1939.

laryngeal tuberculosis and other conditions were discussed from the standpoint of direct laryngoscopic procedure for diagnosis and treatment.

Beriberi.—Hoarseness and weakness of the voice, sometimes aphonia, are among the frequent symptoms of infantile beriberi. Because of insufficient observation of the larynx and considerable confusion concerning the laryngeal lesions in infantile beriberi, Alcantara and de Ocampo [9] carried out clinical studies on a group of infants which included 37 with beriberi. Direct laryngoscopic procedure was performed in all cases. Observations on the laryngeal lesions found were summarized by the investigators as follows: Five patients with acute cardialgic beriberi, in whom the impairment of voice was slight, showed only slight congestion of the vocal cords, the motility being normal. All the rest had impairment of motion of the vocal cords. The right vocal cord was paretic or could not move completely to the median line in 4 patients, stayed immobile in the middle in 9 and assumed a cadaveric position in 3. The left vocal cord was paretic in 5 patients, completely immobile in the median line in 9 and cadaveric in 1. The vocal cords were bilaterally affected in 3 patients. In some of the infants the paretic vocal cord appeared at a lower level than the normal cord. Alcantara and de Ocampo expressed the belief that impaired motility of the vocal cords should be added to the already recognized factors for the diagnosis of infantile beriberi. In cases in which beriberi and acute infection of the respiratory tract are thought to coexist, the motility of the cords is of help in determining whether both are present and what degree of deficiency of vitamin B_1 exists in the child.

Foreign Body.—Stauffer [10] reported 19 cases of the presence of nutshells and kernels in the bronchus. The foreign objects were removed in all but 3 cases; in 2 cases the foreign body was coughed out before the bronchoscope was used, and in the other permission for the operation could not be obtained. Most of the patients were under 3 years of age. After the initial accident there is usually an interval in which the patient is free from symptoms, a period followed by severe illness. Unless the significance of the accident is appreciated and removal of the foreign body promptly performed, obstructive emphysema is followed by drowned lung, with complications of abscess of the lung or empyema resulting later. In this group, death occurred in 2 cases; in 1 bronchoscopic procedure was refused and an autopsy revealed a peanut in the bronchus, together with atelectasis, and in the other the

9. Alcantara, V. C., and de Ocampo, G.: The Larynx in Infantile Beriberi, Arch. Otolaryng. **30**:389 (Sept.) 1939.

10. Stauffer, F. L.: Nutshells and Kernels in the Bronchus, Rocky Mountain M. J. **36**:93 (Feb.) 1939.

postoperative course was complicated by burns over the face, neck and chest and at autopsy atelectasis of both lungs was found.

In reporting the successful removal of peanuts from lobar bronchi of a group of 8 patients, Gerlings [11] emphasized the importance of the clinical and roentgenologic recognition of lobar emphysema. The changes are not so distinctive as those noted in obstructive emphysema of an entire lung, resulting from partial obstruction to a main bronchus.

Gill [12] reported 36 cases of the presence of vegetable foreign bodies in the tracheobronchial tree, in which the objects were removed bronchoscopically with the exception of 2 cases in which removal was through the tracheotomy wound and 4 in which the object was coughed out. One death, that of a moribund child in whom the foreign body had been present for three months, could not in any way be attributed to bronchoscopic procedure. Tracheotomy was necessary in 9 instances. Almost half of the foreign bodies were peanuts, but the most severe reactions were noted in the 3 children in whom the obstructive bodies were pinto beans.

In a discussion of the nature and significance of pathologic changes consequent on prolonged lodgment of foreign bodies in the lower airway, Butler and others [13] reported in detail their findings in 9 cases in which a foreign body was proved to be present. In 5 cases, one of the two common causes of delay in diagnosis of presence of a foreign body was operative, namely overlooking or disregarding a clearcut history of foreign body accident. The bronchoscope was employed in 8 cases but in only 1 was the foreign body successfully removed. Acute nonsuppurative pneumonitis and localized abscess each occurred but once. Contralateral bronchopneumonia occurred twice. Chronic bronchiectasis was demonstrated in 5 cases. Bronchostenosis occurred but once. Empyema, a common complication of pulmonary suppuration, occurred in 3 instances. In 1 case abscess of the brain occurred as a terminal complication in bronchiectasis due to a retained but unsuspected foreign body. Particular emphasis should be placed on two pathologic conditions, acute suppurative pneumonitis and chronic suppurative bronchiectasis. One or both of these were observed in 7 of the 9 patients. It is reasonable to believe that they are evolutionary phases of the same entity and that bronchiectasis will probably occur in any patient who has survived prolonged obstruction of the air

11. Gerlings, P. G.: Foreign Bodies in the Air Passages Causing Unilobar Obstructive Emphysema, J. Laryng. & Otol. **34**:23 (Jan.) 1939.

12. Gill, E. G.: Management of Organic Foreign Bodies in Trachea and Bronchi of Children, Virginia M. Monthly **66**:275 (May) 1939.

13. Butler, E. F.; Lincoln, N. S.; Deegan, J. K., and Horton, R.: The Late Results of Foreign Bodies Long Retained in the Lower Airways, Ann. Otol., Rhin. & Laryng. **48**:817 (Sept.) 1939.

passages by an aspirated foreign body. It therefore follows that once pulmonary suppuration has become established, removal of the foreign body is no longer adequate to prevent or cure chronic disease. Extirpation of the damaged lobe becomes a requisite for cure.

Diagnosis.—The bronchoscopist who has had opportunity to visualize the respiratory passages and observe patients with bronchial obstruction often places a different interpretation on certain symptoms and physical signs observed in patients with acute diseases of the respiratory tract. Gittins [14] referred to the frequent diagnostic misunderstandings occurring in judgments on partial bronchial obstruction. The symptoms and signs produced by inhalation of a foreign body are entirely different from those produced by the common descending infections of the respiratory tract. Bronchopneumonia is often atelectasis secondary to mechanical obstruction of a bronchus by masses of mucus. In such cases the infection and the type and virulence of the organisms are frequently of less importance than the obstruction to the bronchus. Bronchoscopic aspiration not only is of value in diagnosis but has a definite place in the treatment of many of those conditions which often are diagnosed as bronchopneumonia.

The history is of great importance, especially when the patient is a child. The sudden onset of respiratory symptoms in a child previously well should immediately suggest foreign body. In many instances of so-called pneumonia and pulmonary abscess the condition might have been prevented if attention had been given to the possibility of foreign body as the probable reason for the sudden onset of respiratory symptoms. Gittins concluded by stating that closer cooperation of the general physician, the internist and the pediatrician with the bronchoscopist in the diagnosis and treatment of acute obstruction, inflammation and infection of the respiratory tract will surely result in the benefit of all concerned, but especially the benefit of infants and young children, who are so prone to suffer seriously from acute involvement of the chest.

The term "unresolved pneumonia" is usually employed loosely and commonly refers to the persistence of pulmonary changes after an infection, presumably pneumonia, has failed to respond to treatment and has continued unchanged well beyond the time of self limitation of conditions erroneously considered to be pneumonia. McGibbon, Baker-Bates and Mather [15] examined bronchoscopically 38 patients whose conditions were incorrectly diagnosed, on the basis of roentgen examination and clinical observations, as unresolved pneumonia. Eight of

14. Gittins, T. R.: The Acute Chest from the Bronchoscopic Standpoint, Ann. Otol., Rhin. & Laryng. **48**:1087 (Dec.) 1939.

15. McGibbon, J. E. G.; Baker-Bates, E. T., and Mather, J. H.: Importance of Bronchoscopy in Unresolved Pneumonia, Lancet **2**:183 (July 22) 1939.

these were found to be suffering from bronchial carcinoma, 1 from an extrabronchial tumor of unknown character, 2 from impacted nonopaque foreign body, 5 from bronchiectasis, 1 from inflammatory stenosis of a bronchus, 2 from pulmonary abscess and 1 from enlarged bronchial lymph nodes. In 18 children who exhibited varying degrees of incomplete bronchial obstruction, secretion was found. From these data it may be seen that although the clinical and roentgenologic findings suggested unresolved pneumonia, the common lesion was caused by bronchial obstruction. The conditions which are diagnosed as unresolved pneumonia commonly are those in which there is partial bronchial obstruction with secondary changes distal to it. In cases of complete stenosis there is evidence of lobar or segmental collapse and the findings differ greatly from those in unresolved pneumonia. The age of patients is important in connection with this group of diseases. In children and young adults, bronchial obstruction is more often due to foreign body, secretion or enlarged lymph nodes. In adults, bronchial carcinoma is a common finding. When contemplating a diagnosis of unresolved pneumonia one must recall that the common secondary results of bronchial obstruction are pneumonitis, collapse, bronchiectasis, pulmonary abscess and gangrene. If, therefore, a patient whose condition is diagnosed as unresolved pneumonia does not exhibit progressive improvement by clinical and roentgen examination, the bronchoscope should be employed.

The outlook for persons suffering from various pulmonary disorders has improved remarkably during the past decade. This is the result of improved diagnostic procedures and therapeutic measures. Arbuckle and Stutsman [16] emphasized the importance of team work in the field of pulmonary diseases, notably in thoracic surgery. While physical examination and roentgen studies are necessary for the demonstration of pulmonary disorders, in many instances endobronchial inspection and study of specimens of tissue and secretions removed bronchoscopically are necessary to establish an etiologic diagnosis. The excellent results secured by bronchoscopic measures in the treatment of pulmonary abscess indicate the need for considering this method when outlining treatment in such a case. A number of case reports are cited to emphasize the importance of the use of the bronchoscope in diagnosis and treatment of various pulmonary diseases.

The attempt to use bronchoscopic procedure alone, without conscientious teamwork, has been, in the opinion which Orton [17] expressed,

16. Arbuckle, M. F., and Stutsman, A. C.: The Bronchoscopist and the Thoracic Surgery Team, J. A. M. A. **133**:1394 (Oct. 7) 1939.

17. Orton, H. B.: Bronchoscopy as an Aid in Treatment, J. Indiana M. A. **32**:683 (Dec.) 1939.

a dominant factor in producing confusion as to its real value in the diagnosis and treatment of pulmonary diseases. The internist or pediatrician who first sees the patient must decide if the bronchoscope is to be employed. Bronchoscopic removal is the only method to be considered for the extraction of foreign bodies lodged in the tracheobronchial tree. Obscure diseases of the chest should have the benefit of bronchoscopic investigation. Use of the bronchoscope should be a routine procedure in cooperation with the thoracic surgeon and internist.

Allergy.—In a report on the occurrence of obstructive atelectasis in 7 allergic children, Friedman and Molony [18] discussed the etiologic factors. These included spasm of the bronchial musculature, thickening of the bronchial and bronchiolar walls, edema, hyperplasia, hypertrophy and cellular infiltration, the presence of thick, tenacious mucus and paradoxic collapse of the bronchi during expiration. Treatment is concerned first with giving immediate relief to the patient and secondly with the prevention of recurrence. The treatment is of interest to bronchologists, for if the atelectasis persists in spite of the customary employment of postural drainage, of expectorants and of epinephrine hydrochloride, bronchoscopic aspiration is the method of choice. Repeated aspiration may be necessary before adequate ventilation of the bronchial tree is secured. Friedman and Molony suggested the possibility of recurrent atelectasis as a precursor of bronchiectasis.

Chang [19] reported 2 cases of acute laryngeal obstruction proved to be definitely allergic in origin, with specific sensitivity to milk. In the first case the allergic manifestations involved the larynx and the gastrointestinal tract. In the second case the tracheobronchial tree as well as the larynx was involved. There was edema of the mucosa of the trachea and bronchi, together with much thin mucous exudation. In both cases tracheotomy was necessary for relief of dyspnea. Chang emphasized the importance of considering the possibility of allergy as an etiologic factor in the management of all patients with laryngeal obstruction.

Rupture of the Bronchus.—A case of rupture of the left main bronchus from external trauma, in which recovery occurred, was reported by Jones and Vinson.[20] This usually fatal condition was promptly recognized and immediate treatment given for the bilateral tension pneumothorax and mediastinal emphysema. Suppuration did

18. Friedman, T. B., and Molony, C. J.: Role of Allergy in Atelectasis in Children, Am. J. Dis. Child. **58**:237 (Aug.) 1939.

19. Chang, C. S.: Allergy of the Larynx with Report of Two Cases, Ann. Otol., Rhin. & Laryng. **48**:783 (Sept.) 1939.

20. Jones, F. W., and Vinson, P. P.: Nonfatal Rupture of the Left Main Bronchus from External Trauma, Surgery **5**:228 (Feb.) 1939.

not develop, but complete atelectasis of the left lung occurred. Bronchoscopic examination revealed bronchial stenosis due to stricture and a healing area of necrosis on the posterior wall of the left main bronchus. Five months after the accident there was no distal pulmonary infection, and the patient was described as being quite well.

Pulmonary Suppuration.—Bronchiectasis is commonly considered as an anomaly involving the lower lobes or a middle lobe. The occurrence of bronchial dilatation in an upper lobe usually suggests a tuberculous process. Rilance and Howlett [21] observed 3 patients with a condition diagnosed as nontuberculous bronchiectasis. In these patients there was no evidence of tuberculosis, and definite bronchiectasis was demonstrated after instillation of iodized oil. Rilance and Howlett said they were agreed that either an active or a healed tuberculosis is the causative factor in the vast majority of cases of bronchiectasis of the upper lobe.

NEOPLASMS

Papilloma.—The extension of papilloma of the larynx into the trachea is not uncommon; extension to the tracheal bifurcation and into a bronchus is not so frequently observed. In the case reported by Patterson [22] tracheotomy was performed for relief of obstructive laryngeal dyspnea and a direct laryngoscopic procedure was frequently done to remove a papilloma of the larynx. The lesion ultimately ceased to recur, and the larynx appeared normal. Five months later, the patient returned so dyspneic and cyanotic that asphyxiation appeared imminent, this in spite of an unobstructed tracheotomy tube in the trachea. Bronchoscopic examination through the tracheal fistula revealed papillomas obstructing the trachea and the left bronchus. Treatment consisting of frequent removals by means of the bronchoscope, the employment of a cane-shaped tracheal cannula and constant attendance of trained personnel to keep the airway open was finally rewarded by nonrecurrence of the growths, return of a good voice and a normal larynx.

Vigi [23] reported the occurrence of two successive attacks of collapse of the lower lobe of the right lung in a patient aged 16 years who was suffering from laryngotracheal papillomatosis. A moderate pulmonary hemorrhage preceded the initial pulmonary collapse. In the discussion

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21. Rilance, A. B., and Howlett, K. S., Jr.: Nontuberculous Upper Lobe Bronchiectasis, Am. Rev. Tuberc. **40**:204 (Aug.) 1939.

22. Patterson, E. J.: Multiple Papilloma of the Larynx, Trachea and Left Bronchus in a Child, Ann. Otol., Rhin. & Laryng. **48**:1080 (Dec.) 1939.

23. Vigi, F.: Two Successive Attacks of Massive Collapse During Laryngotracheal Papillomatosis, Arch. ital. per le mal. d. trachea-bronchi-esophago **7**:39 (Jan.-March) 1939.

of the possible cause of the collapse it was pointed out that the papilloma involved only the larynx and the upper part of the trachea. The opinion was expressed that the collapse of the lower lobe may have resulted from reflex active contraction of the pulmonary musculature; however, the decreased pulmonary ventilation produced by the papillomatous obstruction of the larynx and upper part of the trachea could not be excluded as a contributory factor.

Mixed Tumor of the Trachea.—Mixed tumors of the trachea are extremely rare. In the case reported by Gerlings and Roegholt,[24] that of a woman aged 50, there was a history of difficulty in breathing of long standing, which was aggravated after an influenzal attack eighteen months before the patient's admission to the hospital. Marked dyspnea with stridor and cyanosis on the slightest exertion was observed. There was no dysphagia. Mirror laryngoscopic examination revealed a smooth swelling arising from the posterior wall of the trachea and occupying the greater part of the lumen. A lateral roentgenogram of the neck showed a large semiglobular mass in the upper part of the trachea, apparently arising from the posterior wall. The most probable diagnosis was a benign tumor. The growth was removed through the tracheostomy opening. It separated readily from the surrounding tissues and exhibited all the clinical appearances of a benign lesion. The histologic studies revealed a typical mixed tumor such as is found in the parotid gland.

Howarth [25] reported a case of mixed tumor of the trachea occurring in a man aged 69. The patient had complained of gradually increasing dyspnea for several months. Mirror laryngoscopic examination revealed a smooth, rounded, shiny swelling immediately below the level of the vocal cords, which was more prominent on the right side. Because of the marked dyspnea a low tracheotomy was performed. The patient was kept under observation for a time and then was lost sight of, to reappear about two years later. At that time the subglottic tumor presented an appearance similar to that noted previously except that the growth seemed to have increased in size. Removal was decided on, and the trachea was opened anteriorly in the midline. The growth was readily separated from the surrounding tissues. The histologic studies of the tumor suggested an adenoma closely resembling a mixed salivary tumor, often found in the parotid gland.

Carcinoma of the Trachea.—Two cases of carcinoma of the trachea were reported by Cann.[26] In both the patients were women. The

24. Gerlings, B. G., and Roegholt, M. N.: Mixed Tumor of the Posterior Wall of the Trachea, J. Laryng. & Otol. **54**:194 (April) 1939.

25. Howarth, W.: Mixed Tumor of the Trachea, J. Laryng. & Otol. **34**:205 (April) 1939.

26. Cann, R. J.: Basal Celled Carcinoma of Trachea, J. Laryng. & Otol. **54**: 197 (April) 1939.

symptoms were stridor, dyspnea, unproductive cough and on one occasion slight hemoptysis. There were no vocal disturbances. In neither case was anything observed by mirror laryngoscopic examination. In both the diagnosis was made by biopsy, the tissue in 1 case having been removed bronchoscopically and in the other at the time of tracheotomy. The extent of involvement of the tumor was clearly shown by roentgen examination after instillation of iodized oil into the trachea. In 1 of the cases treatment was by irradiation therapy and in the other by teleradium. In both cases the tumor has apparently disappeared and the tracheal obstruction has been relieved.

In a study of carcinoma of the trachea, carried out for the purpose of correlating the pathologic observations with the symptoms and treatment, Olsen [27] added 9 cases that had not been previously reported. The symptoms, which are caused chiefly by certain mechanical factors, are dyspnea, which may be paroxysmal, cough and stridor. Later, hemoptysis, expectoration, bronchopulmonary infection and dysphagia may result. While the history, symptoms, signs and roentgen findings are important in diagnosis, tracheoscopic examination and biopsy are essential in practically every case. The prognosis is generally unfavorable. Treatment is difficult and unsatisfactory. The diagnosis commonly is made late. Surgical resection of the trachea, local removal and cauterization with surgical diathermy carried out through a bronchoscope or through the tracheotomy wound appear to be the most effective methods of treatment.

Cylindroma.—Six cases of cylindroma, in 4 of which the lesion occurred in the tracheobronchial tree, were reported by Kramer and Som.[28] When observed bronchoscopically these tumors are distinguished by an encapsulated, lobulated, grayish-appearing mass with an intact mucosa. The tumor is sessile and slow growing, and produces destruction by pressure as well as by actual invasion. Distant metastasis and transition to carcinoma are rare, but there is a marked tendency toward local recurrence. Histogenesis of this type of mixed tumor was discussed. Endoscopic removal can be satisfactorily accomplished by electrocoagulation, as demonstrated by Kramer and Som, but if a tendency toward recurrence appears radiotherapy offers valuable aid in treatment.

Fibrolipoma.—Benign tumors of the bronchi are no longer of sufficient rarity to warrant in themselves special interest; certain types are, however, not commonly met with. A case of bronchial fibrolipoma in

27. Olsen, A. M.: Carcinoma of the Trachea, Arch. Otolaryng. **30**:615 (Oct.) 1939.

28. Kramer, R., and Som, M. L.: Cylindroma of the Upper Air Passages, Arch. Otolaryng. **29**:336 (Feb.) 1939.

a man aged 48 was reported by McGlade.[29] The onset of the patient's illness five weeks before consultation was considered as an attack of pneumonia. The thoracic symptoms never completely cleared up, and the patient was referred for an examination of the chest, which was to include bronchoscopic study. A roentgenogram of the chest revealed evidence of obstructive atelectasis of the left lung. At the time of bronchoscopic examination a rounded mass found completely occluding the left bronchus was removed. It appeared smooth and was not ulcerated. It was 5 cm. in length. Immediately after removal of the tumor the patient was able to take a deep breath, and he commented that he had been unable to do so for over a year. It is interesting to note that in this case wheezing respiration had been present for some time, but apparently no particular significance had been attached to it.

Myoblastoma.—In a case of myoblastoma of the bronchus reported by Kramer,[30] the growth completely occluded the bronchus to the lower lobe of the right lung, producing a lobar atelectasis. There were symptoms and signs of pulmonary suppuration, namely, fever, cough, purulent expectoration and clubbing of the finger tips. The growth appeared pinkish gray and was pedunculated. It was removed bronchoscopically with punch forceps and subsequent diathermic coagulation of the base. The patency of the bronchus was reestablished, and five months later the patient was symptom free and the lower lobe had reexpanded.

Carcinoma.—According to Faquino,[31] bronchiogenic carcinoma occurs more often in the right lung than in the left, and involvement of the lower lobes is more frequent than that of the upper. The insidious onset of this disease often interferes with an early diagnosis, which is essential to effective therapy. The more general use of bronchoscopic procedure in treatment of malignant growths in the lungs has facilitated not only prompt recognition of the condition but also selection of patients for operation by accurate localization of the lesion. Roentgenographic examination plays a large part in suggesting the presence of an early bronchial malignant growth, while the more advanced conditions present definite roentgen appearances. General belief is prevalent that bronchial carcinoma originates in the larger bronchi, but increased diagnostic facilities have demonstrated early lesions in bronchial subdivisions of the second or the third order so that infiltration of the stem bronchus may occur in the final stages. Treatment should be directed

29. McGlade, T. H.: Fibro-Lipoma of the Bronchus: Report of a Case, Ann. Otol., Rhin. & Laryng. **48**:240 (March) 1939.

30. Kramer, R.: Myoblastoma of the Bronchus, Ann. Otol., Rhin. & Laryng. **48**:1083 (Dec.) 1939.

31. Faquino, G. J.: The Value of Bronchoscopy in Bronchiogenic Carcinoma, New Orleans M. & S. J. **91**:429 (Feb.) 1939.

toward surgical extirpation when possible, the alternative being irradiation either by radon implantation or roentgen therapy. Faquino discussed 4 cases selected at random to typify the delayed diagnosis when only palliative therapy can be instituted.

Sixteen cases of malignant lesions and 3 of benign bronchial neoplasms were reported by Davis.[32] In 82 per cent of the cases the diagnosis was made by bronchoscopic examination in connection with biopsy, while in the remainder the bronchoscopic findings were sufficient to support the clinical diagnosis. When the actual tumor cannot be seen the bronchoscopic findings of fixation, rigidity, carinal widening and absence of respiratory movements form valuable evidence. Symptomatic analysis and diagnostic study are emphasized. In the 3 cases of benign growths the tumor was removed perorally, and Davis advocated that this method of treatment be used unless the tumor cannot be entirely eradicated. Lobectomy or pneumonectomy is recommended for treatment of malignant new growths in the bronchus.

Although Lockwood [33] stated that pain ranks third in frequency among symptoms of bronchial carcinoma his 3 patients all complained of pain. Wheeze as a symptom of pulmonary cancer is frequently overlooked but when accompanied by cough and bloody sputum constitutes strong evidence of neoplasm. Bronchoscopic examination still remains the most definite and positive diagnostic procedure available, although roentgenographic study renders valuable aid.

Sarcoma.—A case of primary sarcoma of the bronchus occurring in a youth aged 19 years was reported by Pollak and others.[34] The diagnosis was based on the bronchoscopic appearance of a soft spongy growth in the left main bronchus and on histologic studies of the tissue removed at several bronchoscopic examinations. Most of the tumor was extirpated bronchoscopically; the residuum was treated by fulguration. The patient was observed one year later and found to be free from recurrence of the tumor.

Bronchopulmonary Tuberculosis.—Advocating routine bronchoscopic examinations in all cases of active pulmonary tuberculosis, McIndoe and others [35] reported on their examination of 272 patients with tuberculosis observed over a period of more than one and a half years.

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32. Davis, E. W.: Bronchial Tumors: Diagnosis and Treatment, South. Surgeon **8**:47 (Feb.) 1939.

33. Lockwood, I. H.: Primary Carcinoma of the Bronchus, South. M. J. **32**: 30 (Jan.) 1939.

34. Pollak, B. S.; Cohen, S.; Barrone, M. G., and Gnassi, A. M.: Primary Sarcoma of the Bronchus, Am. J. Roentgenol. **41**:909 (June) 1939.

35. McIndoe, R. B.; Steele, J. D.; Samson, P. C.; Anderson, R. S., and Leslie, G. L.: Routine Bronchoscopy in Patients with Active Pulmonary Tuberculosis, Am. Rev. Tuberc. **39**:617 (May) 1939.

Eleven per cent of the patients showed evidence of tuberculous involvement of the trachea or bronchi, evidence based on the appearance of the lesion rather than on results of histologic examination. Persistent oral wheeze was the most frequent symptom encountered. Bronchial obstruction, unexplained spread of the tuberculous infiltration or atelectasis was most commonly associated with tuberculous tracheobronchitis. An analysis was made to determine whether bronchoscopic procedure exerted a deleterious effect on any of their patients. There was an increase in the pulmonary disease in only 4 patients, according to a comparison of the prebronchoscopic and postbronchoscopic roentgenograms. The laryngeal findings revealed no evidence of lasting severe tuberculous increase, either traumatic or nonspecific. In some cases the quantity of sputum was increased for a few days after bronchoscopic procedure, but there was no significant change on the basis of the number of tubercle bacilli found. There were rises in temperature among a small group of patients, but these were not regarded as significant.

Morlock and Hudson [36] cited their patients as illustrative of indications for the use of the bronchoscope in dealing with pulmonary tuberculosis. The patients consisted of those with normal sputum, those showing areas of collapse or obstructive emphysema, those with symptoms suggestive of tracheobronchial tuberculosis and those in whom there was another associated disease. Whether the indications for bronchoscopic procedure are restricted to the ones noted or whether these are to be extended, Morlock and Hudson express the opinion that this diagnostic procedure can yield valuable information in a number of cases of pulmonary tuberculosis, that it is harmless and that it will be used more extensively.

According to a report submitted by Holbrook and Rabinowitz,[37] 414 bronchoscopic examinations were performed on 284 patients. Of these patients, 66 were nontuberculous and 218 tuberculous. In a majority of the tuberculous patients the disease was far advanced. On 66 the bronchoscopic examination was performed before thoracoplastic operation; other indications, besides the bronchoscopic findings, were persistently positive sputum after collapse therapy (determining the side on which the active disease was located), wheezing respiration, suspected atelectasis, persistently normal sputum with positive roentgen findings and positive sputum with little roentgen evidence. In the experience of Holbrook and Rabinowitz the treatment of tuberculous bronchitis has been unsatisfactory.

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36. Morlock, H. V., and Hudson, E. H.: Bronchoscopy in Pulmonary Tuberculosis, Brit. M. J. **1**:381 (Feb. 25) 1939.

37. Holbrook, J. H., and Rabinowitz, P.: Bronchoscopy in the Sanatorium, Canad. M. A. J. **41**:542 (Dec.) 1939.

Three cases in which there were normal roentgen findings and no acid-fast bacilli in the sputum and in which the diagnosis of active pulmonary tuberculosis was made at bronchoscopic examination were reported by Shipman.[38] In all the cases, smears and cultures made from bronchial secretions showed acid-fast bacilli, and in 1 case cicatricial stenosis of the right bronchus was found.

In the opinion of Cohen and Wessler,[39] tuberculous infection of the trachea and bronchi is always secondary to some previously existing focus of tuberculosis in the chest and is usually found in patients with rather far advanced pulmonary disease for whom the prognosis is poor. A review of 20 cases revealed that the lesion occurred most commonly in a main bronchus and resulted in atelectasis either of a lobe or of an entire lung. Whenever in the course of pneumothorax treatment a collapsed lobe exhibits no tendency to reexpand when the treatment is discontinued, one may suspect an obstruction of the bronchus. A wheeze or rhonchus is additional evidence in support of this suspicion. Since the bronchi in the presence of long-standing pulmonary tuberculosis may be insensitive to inflammatory changes of the mucous membrane, bronchial lesions may be latent for a considerable time and may be overlooked unless routine bronchoscopic examinations are carried out. In young children the rupture of caseous lymph nodes into a bronchus has been recognized, while in adults such nodes may compress and erode neighboring structures with serious consequences to the bronchi, the pulmonary blood vessels and the lungs. As the patient grows older the caseous nodes tend to become anthracotic and indurated, so that the tendency toward ulceration and obstruction is not so great. Adhesion of necrotic lymph nodes to the esophagus may produce small traction diverticula. Severe and fatal pulmonary hemorrhage may follow erosion of a branch of the pulmonary artery and of the bronchial wall, while ulcerations and tuberculous granulations do not seem to give rise to severe hemoptysis. Simple tuberculous ulcerations of the mucous membrane either heal spontaneously or respond to chemical cauterization. Cohen and Wessler contended that endobronchial dilation of strictures is inadvisable and that physiologic rest of the lung produced by complete closure of the strictured bronchus is necessary for cure.

With the more common employment of the bronchoscope in dealing with tuberculosis, the recognition of tuberculous tracheobronchitis and the use of direct treatment have received considerable attention. In a

38. Shipman, S. J.: Diagnostic Bronchoscopy in Occult Tuberculosis, Am. Rev. Tuberc. **39**:629 (May) 1939.

39. Cohen, A. G., and Wessler, H.: Clinical Recognition of Tuberculosis of the Major Bronchi, Arch. Int. Med. **63**:1132 (June) 1939.

bronchoscopic study of 516 tuberculous patients, Hawkins [40] found 132 who showed gross evidence of tuberculous bronchitis. In a majority the involvement was unilateral. In 43 of these there was extensive ulceration of the major bronchus, with extension into the trachea in 27 patients. In a few the main bronchus was completely occluded. Although bronchoscopic examination in connection with tuberculosis has not been routinely done by Hawkins, this examination was carried out on patients who exhibited the classic symptoms and signs of tuberculous tracheobronchitis, namely asthmatoid attacks, wheeze, rhonchi, dyspnea out of proportion to vital capacity, excessive cough with tenacious sputum, constant tendency to clearing of the throat and persistently positive sputum with no other evidence of pulmonary tuberculosis. In Hawkins' case a majority of tuberculous mucosal ulcerations in the tracheobronchial tree healed more readily and with less stenosis when treated with cauterization than when untreated. Complications due to the use of the bronchoscope in cases of tuberculosis are rare.

Omerod [41] stated that tuberculosis of the tracheobronchial tree is most common in patients between the ages of 20 and 40 years and in the majority of cases is associated with advanced pulmonary infection. He contended that if the larynx is involved and there is tuberculous disease of the trachea the condition will be found in the upper part of that tube, with perhaps some lesions in the lower part of the treachea and bronchi. In those cases in which the larynx is normal, the disease is usually confined to the lower half of the trachea and bronchi. From a study of available statistics Omerod concluded that tuberculous lesions occur in about 10 per cent of all cases of pulmonary phthisis, but that in the more severe types of the disease, such as those requiring thoracoplastic procedure, the incidence is much higher.

The report of Nalls and Cole [42] showed them to be agreed with other writers that the final diagnosis of the presence and the cause of bronchial obstruction in pulmonary tuberculosis rests on visualization of the lesions by bronchoscopic examination. The bronchoscopic findings of bronchial ulceration observed in their cases are graphically shown.

The importance of bronchoscopic examination of tuberculous patients before thoracoplastic operation is emphasized by Benedict,[43] who

40. Hawkins, J. L. H., Jr.: Tuberculous Tracheobronchitis, Am. Rev. Tuberc. **39**:46 (Jan.) 1939.

41. Omerod, F. C.: Tuberculous Tracheobronchitis, Brit. J. Tuberc. **39**:29 (Jan.) 1939.

42. Nalls, W. L., and Cole, D. B.: Tuberculous Tracheobronchitis, Virginia M. Monthly **66**:387 (July) 1939.

43. Benedict, E. B.: Bronchoscopic Dilatation of Bronchial Stenosis Following Thoracoplasty for Tuberculosis, New England J. Med. **220**:617 (April 13) 1939.

reported 3 cases in which postoperative bronchial stenosis developed after thoracoplastic procedure. He expressed the belief that the stenosis was caused by preexisting tuberculous tracheobronchitis and that the subsequent collapse of the lung resulted in an approximation of mucous surfaces, local spread of the disease, ulceration and stenosis. Gradual dilation of the stenosed parts and aspiration of retained secretions were carried out with marked benefit to the patients. Although the bronchial lumen remained patent after dilation, Benedict advocated repetition of this procedure to prevent recurrent stenosis. No activation of the tuberculous process after bronchoscopic manipulation was noted.

Aspergillosis.—Invasion of the lung by aspergilli may be more common than would appear from the number of reported cases. The clinical course of bronchopulmonary aspergillosis is similar in many respects to that of chronic pulmonary tuberculosis and in some cases is considered as such. The patient reported by Stolow [44] was referred as having pulmonary tuberculosis. Results of examination for tubercle bacilli were repeatedly normal. The patient, a farmer, acquired a cough while threshing oats. This later became productive, and hemoptysis occurred. Because of the history, the presence of signs over the upper lobe of the right lung and the absence of tubercle bacilli, bronchoscopic examination was performed. This revealed inflamed and thickened mucosa in the right bronchus, with a small quantity of thick mucopus. Bacteriologic study of secretions revealed a member of the genus Aspergillus. Stolow emphasized the importance of a careful history and studies of the sputum for fungus in cases of patients thought to be tuberculous but with normal sputum.

Lung Mapping.—The disappearance of the roentgenographic shadows of pulmonary abscess with its surrounding pneumonitis and the absence of symptoms referable to the suppurative process usually are accepted as conclusive evidence that an abscess has healed. Franklin [45] studied a group of cases of apparently healed pulmonary abscess and found that residual pathologic defects in the lung and bronchi often may be demonstrated by instillation of iodized oil. He expressed the opinion that this procedure should be employed routinely in these cases to ascertain the condition of the bronchial tree and that the clinical concept of healing of acute suppurative bronchopulmonary processes should take into account the residual pathologic changes in the lungs and bronchi.

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44. Stolow, A. J.: Primary Broncho-Pulmonary Aspergillosis, J. M. Soc. New Jersey **36**:484 (Aug.) 1939.

45. Franklin, R. M.: Bronchographic Study of Apparently Healed Lung Abscess, Am. J. M. Sc. **198**:95 (July) 1939.

Soulas [46] discussed the general indications for the instillation of iodized oil as a diagnostic procedure. The purpose for which it is most frequently employed is for ascertaining the presence of bronchial dilatations. Next in frequency is the determining of the presence of bronchial stenosis of either intrinsic or extrinsic origin. Various methods of introduction, including transglottic injection, transnasal instillation by cannula or catheter and the bronchoscopic method, were discussed. The bronchoscopic method is valuable for children; it is also advantageous in cases of bronchial stenosis, as it permits introduction of the oil under direct visual guidance.

Pearson and Thornton [47] described a bronchoscopic method for children, in which a small Magill tube is inserted through the nose into the trachea, with the child under general anesthesia. A catheter is passed through the endotracheal tube, and iodized oil is instilled into the bronchi under fluoroscopic guidance.

For mapping pulmonary fields and securing bronchial secretions Rudman [48] used a semirigid catheter placed in the tracheobronchial tree by mirror laryngoscopic procedure. Local anesthesia is applied to the larynx and trachea, the catheter is inserted and iodized oil is instilled under fluoroscopic guidance. By placing the tip in the desired locality and using curved catheters, one may fill the upper and the middle lobe, obviating the need of utilizing posture.

Lipoid Pneumonia.—A series of 27 cases of lipoid pneumonia in children was studied by Bromer and Wolman.[49] Among 20 cases in which autopsy was performed, recognition of the condition before death occurred in only 1 case, even though roentgen examinations were performed in the great majority. In two thirds of the cases the pneumonia was associated with some debilitating disease. The site of involvement was always the posterior dependent portions of the lungs, especially the perihilar regions, and the right lung was affected more often than the left. Identification of the oils was not definite, but cod liver oil seemed to be the chief offender; a few of the infants had received petrolatum nose drops. Serial roentgenograms were stressed as valuable aids in diagnosis.

Obstructive Asphyxia.—In an endeavor to explain the cause of death occurring immediately after a successful tracheotomy for obstructive

46. Soulas, A.: Endobronchial Instillation of Iodized Oil in Adults and in Children, Bronchoscop., œsophagoscop. et gastroscop., April 1939, p. 125.

47. Pearson, H. E. S., and Thornton, H.: Bronchography in Children, Brit. J. Radiol. **12**:229 (April) 1939.

48. Rudman, I. E.: Bronchial Catheterization, Am. Rev. Tuberc. **39**:329 (March) 1939.

49. Bromer, R. S., and Wolman, I. J.: Lipoid Pneumonia in Infants and Children, Radiology **32**:1 (Jan.) 1939.

asphyxia, Gatewood and Cary [50] carried out a series of experiments on previously tracheotomized dogs. In one group the airway was obstructed for twenty-four hours, and studies of the blood were then carried out. When this procedure was completed, the obstruction was suddenly released and opportunity given for the animal to breathe through a large unobstructed airway. A second series of studies of the blood were then performed. In a small group of animals the obstruction was continued for only fifteen hours.

Gatewood and Cary concluded that the apnea caused by mechanical asphyxia in animals duplicated the human picture of obstructive anoxia. The sudden lowering of arterial carbon dioxide tension in the animal did not apparently induce any serious or fatal effects on the respiratory center. In the presence of acutely precipitated alkalemia and a sudden drop in carbon dioxide tension, respiration may be disturbed. However, these experiments on animals did not indicate that death can be induced by this phenomenon alone.

ESOPHAGOSCOPY

Tracheoesophageal Fistula.—Congenital tracheoesophageal fistula is of uncommon occurrence. Imperatori [51] reported a case of fistula in a boy aged 7 years; he closed the fistula successfully by plastic operation. The tracheoesophageal opening, about ½ inch (1.27 cm.) long, appeared as a slit in the party wall slightly to the left of the sagittal plane opposite the ends of the third, the fourth and the fifth tracheal ring. At the beginning of the swallowing act it remained closed, but as the larynx receded the opening of the fistula was seen from the tracheal side. There were spastic reactions of the pylorus and cardia, and earlier treatment had been directed toward correcting these. Because of the repeated occurrence of respiratory symptoms, additional studies were carried out, and the fistula was discovered by tracheoscopic examination. Since closure of the fistula the patient has been able to eat without difficulty, although some cardiospasm is still probably present.

A bronchoesophageal fistula occurring in a man aged 31 who had serious compression of the thorax as a result of accident was reported by Piquet and others.[52] The opening in the airway was in the right main bronchus slightly beyond the carina. At this point the right bronchus was distended. The esophagus was greatly dilated at the level

50. Gatewood, E. T., and Cary, M. K.: Certain Phases of Respiratory Failure: An Experimental Study of Subacute Obstructive Asphyxia, Ann. Otol., Rhin. & Laryng. **48**:1073 (Dec.) 1939.

51. Imperatori, C. J.: Congenital Tracheoesophageal Fistula Without Atresia of Esophagus, Arch. Otolaryng. **30**:352 (Sept.) 1939.

52. Piquet, J.; Muller, M., and Marchand, M.: Broncho-Esophageal Fistula Following Thoracic Trauma, Bronchoscop., œsophagoscop. et gastroscop., January 1939, p. 27.

of the fistula, and there was distortion of the trachea, the right main bronchus and the esophagus, together with fixation, suggesting that a hard fibrous mass united the esophagus and the tracheobronchial tree.

Foreign Bodies.—Reporting on a series of 200 cases in which the esophagoscope was used to detect the presence of foreign body, Wrigley [53] emphasized the importance of diagnostic esophagoscopic procedure in all cases in which the roentgenologist is unable to give an absolutely negative report. In a number of cases in which there was a history of the swallowing of some object, the roentgenographic report indicated the presence of a residual flake of barium. In many of these cases the roentgenographic report was negative, but a foreign body was found in a sufficiently large number to justify routine esophagoscopic examination. In 180 of the 200 consecutive cases a foreign body was found and removed; in 6 the foreign body was seen but passed into the stomach, and in 1 case the foreign body was seen but was immovable. In 13 cases the examination revealed no foreign body. Death occurred in 2 cases in the series. In one of these, in which an impacted denture could not be removed owing to a sharp hook which had perforated the esophagus, death resulted from mediastinitis following attempted esophagotomy. In the other case, death followed perforation of the esophagus by a fragment of bone.

Stricture of the Esophagus.—In an analysis of 50 cases of esophageal stricture, Martin and Arena [54] found 48 in which the condition was due to ingestion of lye. In over half of these the patients were children under 2 years of age. The most common anatomic site was the upper third of the esophagus; in 10 cases the strictures were multiple. Following the initial symptoms there is usually a period of one to two weeks with no apparent dysphagia; symptoms return after the formation of stricture, with stenosis of the lumen. Provided the initial poison has been neutralized, Martin and Arena advocated the passage of a mercury-filled catheter into the stomach, as outlined by Bokay, treatment to be begun four days after the accident if the edema and inflammation have subsided sufficiently. Peroral bougienage with a string used as a guide, retrograde bougienage through a gastrostomy opening, peroral esophagoscopic bougienage or retrograde esophagoscopic bougienage must be employed in treating the already developed stricture. In this series there were 8 deaths, 1 of which was attributable to a cause other than the esophageal lesion.

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53. Wrigley, F. G.: A Series of Two Hundred Cases of Oesophagoscopy for Foreign Bodies, Brit. M. J. **2**:334 (Aug. 12) 1939.

54. Martin, J. M., and Arena, J. M.: Lye Poisoning and Stricture of the Esophagus, South. M. J. **32**:286 (March) 1939.

Restoration of function in cases of nonmalignant esophageal stenosis can be accomplished by the accepted methods of dilation in the great majority of cases, but Turner [55] expressed the belief that there are a few conditions requiring some form of reconstructive surgical procedure, such as esophagoplasty. According to Turner, the incidence of esophageal stricture in England is much less than in other countries. Case reports illustrated the results obtained by the standard methods of treatment, and several deaths occurred after instrumentation. He stated the opinion that patients can be taught to swallow bougies with safety; no force is used, and when possible supervision of the dilation is carried out. Gastrostomy has definite value in treatment, not only for maintaining nutrition but also for carrying out retrograde bougienage. In the 19 cases referred to, the causative factors, so far as could be determined, were as follows: corrosives in 5; congenital defects, 5; late results of achalasia, 4; ulceration, 2; acute inflammation, 1, and undetermined in 2.

Benign stricture of the esophagus is observed less frequently than cardiospasm or esophageal carcinoma. According to the experience of Vinson,[56] no etiologic factor can be ascertained in about 20 per cent of cases of stricture of the esophagus. In these, carcinoma commonly is suspected. Diagnosis may be difficult even when esophagoscopic examination is employed. Stricture at the esophagogastric junction is often observed in patients with congenital shortening of the esophagus. Gastrostomy is seldom necessary in the management of benign stricture of the esophagus. With a thread employed as a guide for passing sounds, a benign stricture can be dilated with minimal risk and discomfort and with an excellent functional result. Complete anatomic stenosis of the esophagus can always be prevented by having the patient swallow a thread and allowing it to remain until the dilation has been completed.

The present methods of dilating cicatricial stenosis of the esophagus were described by Eeman,[57] who pointed out certain features which could be improved. He expressed the belief that instead of applying the distending force in an up and down direction one should apply it in the plane in which dilation of the tissues is desired. The conic form of the dilating instruments does not compensate for the mechanical error of the application of force. The forceful application of the dilating

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55. Turner, G. G.: Nonmalignant Stenosis of the Esophagus, Brit. J. Surg. **26**:555 (Jan.) 1939.

56. Vinson, P. P.: Management of Benign Stricture of the Esophagus, J. A. M. A. **113**:2128 (Dec. 9) 1939.

57. Eeman, F. G.: The Brady-Diastase Treatment of Esophageal Stenosis, Bronchoscop., œsophagoscop. et gastroscop., January 1939, p. 40.

apparatus does not permit any gliding of the tissue fibers over one another and therefore does not utilize, except partially, the elasticity of the fibrous tissue. Instead it provokes sudden tearing of these fibers, which is followed by further formation of scar tissue. Eeman proposed to replace this method by one he called Brady-diastase, which is based on the principle that a minimal force applied for a prolonged period is more efficacious than a rapidly dilating force applied for a short time. These objectives are accomplished by using as dilating agents the hydrostatic dilating balloons (Stark) and by applying the force over a longer period.

Ulcer of the Esophagus.—The concomitance of duodenal and of esophageal ulcer, although uncommon, is of interest. The patient examined by Klein and Hochbaum [58] was operated on for duodenal ulcer. Two months later he was readmitted because of dysphagia. Esophagoscopic examination revealed an extensive ulcerated lesion involving the lower part of the esophagus. The appearances suggested carcinoma. When the patient was observed one year later, cicatricial stenosis of the esophagus was found. This responded promplty to dilation, and return of normal esophageal function was obtained.

The symptoms of ulcer of the esophagus often suggest a clinical diagnosis of gastric ulcer. The failure to find any evidence of ulcer by the routine roentgen examination often leads to a revision of the diagnosis. Briggs, Dick and Hurst [59] have found that esophageal ulcer is almost always associated with herniation of the stomach through the diaphragm and with congenitally short esophagus. A small hernia is often overlooked in a routine roentgen study. Both the ulcer and the hernia can be demonstrated by examining the patient in the horizontal position. The diagnosis can always be confirmed by esophagoscopic examination.

Two conditions of which one is necessary for the production of peptic ulcer of the esophagus are (1) gastric mucosa in the lower portion of the esophagus and (2) a relaxed cardia through which gastric juice is constantly regurgitated. Chamberlin [60] suggested that the patency of the cardia might be caused by congenitally short esophagus or diaphragmatic hernia. In his 7 cases either one or both of these abnormalities were present. He named the diagnostic criteria of peptic

58. Klein, I., and Hochbaum, W.: Stenosing Esophagitis Associated with Duodenal Ulcer, Am. J. Roentgenol. **42**:724 (Nov.) 1939.

59. Briggs, P. J.; Dick, R. C. S., and Hurst, A.: Simple Ulcer of the Oesophagus and Short Oesophagus, Proc. Roy. Soc. Med. **32**:1423 (Sept.) 1939.

60. Chamberlin, D. T.: Peptic Ulcer of the Esophagus, Am. J. Digest. Dis. **5**:725 (Jan.) 1939.

ulcer of the esophagus as follows: (1) The ulcer is chronic and unassociated with systemic disease; (2) the symptoms are relieved by peptic ulcer therapy and dilation; (3) free hydrochloric acid is present in the stomach, and (4) the ulcer is visualized by direct examination.

Periesophageal Abscess.—In discussing periesophageal abscesses, Hunt [61] stated that rupture of the esophagus is due to foreign bodies, instrumentation or spontaneous rupture accompanying malignant growth. The most frequent site of perforation is at the upper end, at the cricopharyngeus muscle, for it is there that foreign bodies and instruments first meet resistance. In an analysis of 20 cases of periesophageal abscess Hunt found that in 17 the perforation of the esophagus was caused by foreign body, that in 1 the rupture followed instrumentation and in 2, biopsy. A diagnosis of cervical periesophageal infection is made on the basis of a suspected or observed perforation of the esophagus, marked collapse of the patient at the time of the perforation, pain, tenderness and swelling over the area of dysphagia, sudden rise in temperature with increased leukocyte count, the roentgen signs of widening of the prevertebral or post-tracheal space and emphysema, which may be ascertained by palpation or by roentgen examination. A roentgen study is the determining factor in diagnosis and aids in differentiating between simple cellulitis and abscess formation. In 16 of the 20 cases operation was done and external drainage established, with 12 recoveries and 4 deaths. In the remaining 4 cases, in all of which death occurred, operation was not performed but conservative or esophagoscopic treatment was given.

Cardiospasm.—Bougienage of one variety or another has been practiced for more than fifty years in the treatment of cardiospasm. Browne and McHardy [62] discussed the various methods of dilation and described a mercury pneumatic dilator which they have found useful. Its advantages are as follows: 1. A previously swallowed guiding thread is not required and the instrument is readily passed, being the size of a number 21 Hurst dilator. It is carried through by virtue of the contained mercury, which is sufficient to force the closed sphincter and is in itself a guide. 2. The dilator is passed with less discomfort and does not exhibit a tendency to coil in the dilated prediaphragmatic dilatation. 3. Only a single instrumentation is required, and the dilator offers controlled pneumatic divulsion.

61. Hunt, W. M.: Periesophageal Abscesses: The Importance of Early Surgical Interference, Ann. Otol., Rhin. & Laryng. **49**:128 (March) 1939.

62. Browne, D. C., and McHardy, G.: A New Instrument for Use in Esophagospasm, J. A. M. A. **113**:1963 (Nov. 25) 1939.

In Tucker's [63] experience gentle dilation or stretching of the hiatal esophagus repeated over a considerable period has given the most favorable results in the treatment of cardiospasm. Preliminary roentgen study and open tube esophagoscopic examination of the lower end of the esophagus and cardia should be done, he said, in every case. The mercury-filled pneumatic dilator was described in his paper, and cases were cited in which this method of treatment was successfully employed.

In discussing the reflex etiologic factor in cardiospasm, Bryant [64] did not assume that in all cases the condition could be attributed to reflex etiologic causes. Cases were cited to support the belief, however, that anything which unduly disturbs the reflex arc of the myenteric plexus may serve as an exciting cause of functional stenosis of the esophagus. These cases suggest further that in the event of an obstinate condition which is not relieved by the commonly employed methods of treatment a painstaking search for lesions elsewhere should be resorted to, and furthermore that even when the condition is relieved by ordinary measures reflex factors should be sought so that, if they should be found, their correction could help in the prevention of relapses.

TUMORS OF THE ESOPHAGUS

Osteochondroma.—In reporting a case of osteochondroma of the esophagus, Reeves [65] directed attention to the rarity of this type of tumor in the esophagus. The pedunculated tumor in the reported case was located in the upper thoracic portion of the esophagus and was removed with a cutting forceps after exposure with a Jackson esophageal speculum. The symptoms disappeared for six months after removal; the patient gained 30 pounds (13.6 Kg.) and was able to return to work.

Adenocarcinoma.—Polyps of the esophagus probably constitute the most common type of benign tumor, but the carcinomatous polyp is an unusual finding. Feldman [66] observed a case of adenomatous pedunculated polyp occurring in the upper part of the esophagus. The roentgen appearances exhibited a large polyp which was clearly outlined and appeared to be movable especially when the patient changed position. In the esophagoscopic procedure the polyp was sucked up into the end of the tube. A biopsy was done. The histologic diagnosis was adenocarcinoma. This type of tumor is extremely rare in the upper part of the esophagus.

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63. Tucker, G.: Cardiospasm: A Pneumatic-Mercury Dilator, Ann. Otol., Rhin. & Laryng. **48**:808 (Sept.) 1939.

64. Bryant, D. L.: A Consideration of the Reflex Etiology of Cardiospasm, Ann. Otol., Rhin. & Laryng. **48**:802 (Sept.) 1939.

65. Reeves, E.: Osteochondroma of the Esophagus Removed Perorally with the Aid of a Speculum, Arch. Otolaryng. **29**:151 (Jan.) 1939.

66. Feldman, M.: Adenocarcinomatous Pedunculated Polyp of the Esophagus: Report of a Case, Am. J. Digest. Dis. **6**:453 (Sept.) 1939.

GASTROSCOPY

Gastritis.—The diagnosis of gastritis is difficult to make, and McNeer and Barowsky [67] reported a series of 143 cases in which gastroscopic observations were necessary before definite conclusions could be reached. Their most striking finding was the presence of some form of gastritis in over half the patients studied. Many of the patients (37.8 per cent) with conditions previously diagnosed as "functional dyspepsia" were found to have chronic gastritis. McNeer and Barowsky experienced difficulty in classifying the types of gastritis. Three fourths of the patients with true achylia had an atrophic type, while almost all had some chronic changes. The incidence of chronic inflammation was highest in association with achylia, followed in order of frequency by the gastritides associated with carcinoma, those occurring with chronic resistant duodenal ulcer, those following gastroenterostomies and those in the undiagnosed group. Clinical, laboratory and roentgen study does not give much information in a majority of cases; in occasional cases of advanced hypertrophic gastritis, however, the roentgenograms may lead to accurate diagnosis. Pathologic studies of gastritis are greatly handicapped because of the rapid autolysis of gastric tissue which takes place at postmortem examination.

In an attempt to correlate the clinical and gastroscopic findings, Bank and Renshaw [68] studied 50 cases of chronic superficial gastritis, diagnosed by means of the gastroscope. Some variation in the normal gastric acidity was noted in 80 per cent of this series, hyperacidity being present in 50 per cent. A tendency toward delayed emptying of the stomach, loss of weight and symptoms suggestive of duodenal ulcer were prominent features. Bank and Renshaw were not able to arrive at any characteristic syndrome of chronic superficial gastritis.

Gastroscopic examination afforded a supplementary diagnostic method of study in 200 cases of lesions of the stomach in which examination was made by Freeman.[69] He expressed the opinion that the greatest field for usefulness of the gastroscope is in the diagnosis of the different types of chronic gastritis, although valuable information can be obtained on conditions following gastric operations, obscure gastric hemorrhages, carcinoma and ulcer.

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67. McNeer, G., and Barowsky, H.: A Gastroscopic Study of the Incidence of Chronic Gastritis in Common Gastric Afflictions, Am. J. Digest. Dis. **6**:180 (May) 1939.

68. Bank, J., and Renshaw, J. F.: Chronic Superficial Gastritis, J. A. M. A. **112**:214 (Jan. 21) 1939.

69. Freeman, E. B.: Gastroscopic Study Compared with Other Methods of Diagnosis in Gastric Lesions, J. A. M. A. **122**:217 (Jan. 21) 1939.

In discussing the importance of gastroscopic examination in cases of cancer of the stomach, Liebowitz [70] presented several cases in which that method proved of considerable aid in determining the presence or absence of gastric cancer and in differentiating benign and malignant ulcerations of the stomach. The interpretation of the roentgen shadows can be greatly aided by a knowledge of the gastroscopic appearances of a lesion. The use of the gastroscope is particularly of value in attempts to recognize gastritis which often simulates neoplasm both clinically and radiologically. The employment of gastroscopic examination to supplement roentgen studies and clinical and laboratory examinations will aid in making the diagnosis and detection of gastric cancer more accurate than heretofore.

In a study representing 317 gastroscopic observations on 91 patients, each of whom presented a definite, benign gastric ulcer, Schindler and Baxmeier [71] found two types of mucosal alteration. Inflammatory changes ranging from the reddening, edema and exudation in the superficial form to the segmentation, node formation and erosive changes in the hypertrophic type were observed in 38 patients at the first examination and at some subsequent examination in an additional 10 patients in whom gastritis was not present when they were first examined. In 43 patients with ulcer no gastritis was discovered. Purpuric type changes, which include mucosal hemorrhages, pigment spots and hemorrhagic erosions, were observed in 40 patients. In the series of 43 patients who presented no evidence of gastritis many were examined on more than one occasion, a fact which suggests that the absence of inflammation was not due to a regressive phase. Of the 38 patients with gastritis and ulcer, 16 presented evidences of inflammation which was entirely remote from the ulcer; in 10 the ulcer was found lying in a circumscribed zone of inflammation of variable size, and in 12 there was diffuse gastritis involving extensive areas of the fundus or of both the fundus and the antrum. The incidence of purpuric type lesions in patients not suffering from gastric ulcer is not greater than 6 per cent. It is of interest to note that among 91 patients with ulcer these lesions were observed in 40 (44 per cent).

Carcinoma.—Although the value of gastroscopic examination for early diagnosis of gastric carcinoma is disputed, gastroscopists recognize its value in the differential diagnosis of benign and malignant lesions and in the determination of operability. Schindler and Gold [72] expressed

70. Liebowitz, H. R.: Gastroscopic Observations in Gastric Cancer, Rev. Gastroenterol. **6**:516 (Nov.-Dec.) 1939.

71. Schindler, R., and Baxmeier, R. I.: Mucosal Changes Accompanying Gastric Ulcer: A Gastroscopic Study, Ann. Int. Med. **13**:693 (Oct.) 1939.

72. Schindler, R., and Gold, R. L.: Gastroscopy in Gastric Carcinoma, Especially in Its Early Diagnosis, Surg., Gynec. & Obst. **69**:1 (July) 1939.

the opinion that examination by means of the gastroscope does facilitate early diagnosis and that at times it is superior to all other methods. Ten cases were presented by them to demonstrate the importance of gastroscopic examination in relation to the diagnosis of cancer. In 2 cases an early diagnosis was made only by gastroscopic examination; in 2 additional cases the diagnosis was made conclusive by gastroscopic means; in 3 examination by the gastroscope was important in the differential diagnosis between benign and malignant ulceration, and in the remaining 2 it was valuable in the determination of operability. Gastroscopic and roentgen examination are not competitive, but each supplements the other. Close cooperation between the radiologist and gastroscopist, therefore, is essential in order to make a diagnosis early. An early diagnosis can be made in every case of cancer if roentgenologic and gastroscopic examinations are carried out promptly on the appearance of mild digestive symptoms and of loss of weight which is otherwise unexplained.

Pernicious Anemia.—Schindler and Serby [73] reported on the gastroscopic findings in 23 patients with pernicious anemia. Nine patients did not receive treatment and showed evidences of atrophic or superficial gastritis, either diffuse or patchy and distributed in both the antrum and the body. After receiving treatment, 4 of the 14 patients exhibited no appreciable improvement of the gastric mucosa, while in the remainder almost complete regeneration occurred. Polyps of the mucosa were observed rather frequently in this series.

Phytobezoar.—A case of phytobezoar (food ball) in the stomach, in which diagnosis was based on gastroscopic examination and confirmed at operation, was reported by Ruffin and Reeves.[74] They expressed the opinion that the development of this condition is frequently associated with the ingestion of persimmons; for thirty or forty years their patient had been in the habit of eating at least a quart of persimmons every fall.

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73. Schindler, R., and Serby, A. M.: Gastroscopic Observations in Pernicious Anemia, Arch. Int. Med. **63**:334 (Feb.) 1939.

74. Ruffin, J. M., and Reeves, R. J.: The Value of Gastroscopy in the Diagnosis of Phytobezoar, Am. J. Digest. Dis. **5**:745 (Jan.) 1939.

Abstracts from Current Literature

Ear

THE CENTRAL CONNECTIONS OF THE VESTIBULAR PATHWAYS. W. E. DANDY and P. A. KUNKEL, Am. J. M. Sc. **198**:149 (Aug.) 1939.

The authors sectioned one or both eighth nerves and removed one or both cerebellar hemispheres with and without section of the eighth nerves on a series of dogs and cats. Section of one eighth nerve always resulted in violent whirling of the animal toward the same side, continuing until the animal died of exhaustion a day or two later. Section of both eighth nerves resulted in whirling first to one side and then to the other. Removal of one or both cerebellar hemispheres resulted in loss of equilibrium, but there was never any whirling. Section of one eighth nerve combined with removal of half the cerebellum on the same side resulted in violent whirling, but if the opposite half of the cerebellum was removed instead there was no whirling. The authors conclude that the vestibular pathways decussate like the pyramidal tracts.

(Comment: This conclusion seems to the reviewer to be unwarranted for the following reason: The whirling that occurs after section of one eighth nerve is due to unopposed tonus impulses from the opposite labyrinth. The fact that removal of the cerebellar hemisphere on the side of the cut nerve does not stop the whirling whereas removal of the hemisphere on the side of the intact nerve does control the whirling means that the vestibular pathways go to the cerebellar hemisphere of the same side and do *not* decussate. This is in harmony with clinical experience and anatomic studies.)

SHAMBAUGH, Chicago.

WHAT CONCLUSIONS CAN BE REACHED THROUGH A VESTIBULAR EXAMINATION AS TO THE TYPE AND LOCATION OF AN INTRACRANIAL DISEASE? RUDOLF LEIDLER, Pract. oto-rhino-laryng. **2**:86 (May); 152 (July) 1939.

In a long, comprehensive discussion, the author devotes the first half of his presentation to a description of the anatomic relation between the vestibular nerve and the central nervous system. He traces the nerve and its fibers from their labyrinthine origin to the termination in the spinal cord. He continues with a minute description of the intercommunication between the vestibular nuclei and the ramifications through the upper and lower centers and the interrelation with other tracts and nuclei.

The second half of his discussion deals with the clinical application of various symptoms, treating nystagmus as the most important finding and vertigo as the second. He states that, while nystagmus can be shown on a purely anatomic basis to result from a direct relation between the vestibular nuclei and the nuclei of the eye muscles, the association of vertigo is not clear. However, certain facts are established with a fair degree of certainty in the relation of the structure of the vestibular system to vertigo. The communication of the vestibular system with the motor cells of the anterior horn and the motor nuclei is weak and in man is difficult to establish as an influence on equilibrium. He believes that otolaryngologists in general have overestimated the effect of the labyrinth on equilibrium. He states that with acute unilateral destruction of the labyrinth disturbances of equilibrium are of only short duration and that persons with vertigo of peripheral labyrinthine origin during the quiescent stage do not show any disturbances of equilibrium. He feels also that the otolaryngologist can help the neurologist by careful analysis of the vestibular findings and so help determine

any central lesion and likewise that it is important that the neurologist call on the otolaryngologist for aid in any case of a suspected central lesion.

He then describes the method of examination, stressing the importance of the otoscopic observations on the ear drum, the responsivity of the cochlear system and the vestibular findings, noting particularly in the latter (1) spontaneous nystagmus, (2) caloric responses and (3) responses after rotation.

Some of his findings are as follows: First, disturbances in the vestibular system which are caused by disease of the brain.

I. Reflexes of the ocular muscles of vestibular origin (nystagmus and deviation).

A. Typical vestibular nystagmus composed of a slow and a quick component and normally not spontaneous. On stimulating a normal vestibular system with 5 cc. of water of 27 C. (Kobrak), typical nystagmus is produced to the side opposite the stimulation, and, after a latent period of about twenty seconds, the amplitude and the frequency of movement vary individually, but a pathologic state can be surmised only when there is marked disproportion in both amplitude and frequency on stimulation of the two sides. The last deduction is true also when the rotation test is made.

B. Atypical nystagmus following stimulation. This depends on a disturbance in rhythm.

1. Prolongation of the slow component.
2. Conjugate deviation of the eyes to the tested side plus typical nystagmus. After a caloric stimulation a normal latent period is followed by conjugate deviation in the direction of the slow component. In this position, typical nystagmoid movements follow; the quick component is usually smaller and weaker.
3. Typical nystagmus plus conjugate deviation to the stimulated side. This is the reverse of 2.

Disturbances of rhythm may appear in the following forms: 1. The various phases may follow each other in an irregular fashion. Between the phases, the eyes may rest quietly. 2. Frequently, there is a series of four or five phases of small amplitude, which may disappear quickly. There may be difficulty in differentiating between the slow and the quick components.

C. Conjugate lateral deviation of the eyes. In many cases of central disease of the vestibular system, deviation of the eyes can be seen behind the Frensel glasses and is apparent only when the glasses are used. The patient himself is unaware of this phenomenon. There may be also a uniphasic reaction, in which the quick component is lost. This really is maximal residual deviation of the eyes in the direction of the slow component.

D. Atypical, unrhythmic ocular movement, seen only behind the glasses in certain rare cases of a central vestibular lesion. This type should be differentiated from pendular nystagmus. While it does not have a vestibular origin, it is definitely influenced by the vestibular system.

E. Spontaneous pure rotary nystagmus. This is always seen in disease of the brain. However, frequently it is a rotary component of horizontal or vertical nystagmus.

F. Vertical reflex nystagmus. The association of this reaction with disease of the brain is difficult. However, while definite localization cannot be made, the assumption must be accepted that it is of central origin. Further experimental study of the phenomenon should be made.

G. Postural nystagmus, which occurs when the patient in a horizontal posture looks either to the right or to the left and which disappears on a change in posture. Vertigo is commonly associated. This type of nystagmus is either purely horizontal or rotary, rarely mixed and more rarely vertical. It also usually occurs in only one posture and most frequently in the same direction. This form of nystagmus occurs only with central vestibular disturbances.

II. Disturbances of responses to caloric and rotatory stimulation. In diseases of the central nervous system, these disturbances are more common than previously assumed. One should not class the responses as hyperactive, hypoactive or nonactive. There may be various types of disturbance of these responses of the vestibular system.

A. Extirpation of the cochlear nerve. The patient is deaf and does not respond to any vestibular stimulation.

B. Nonsuppurative encephalitis. Here the cochlea is not involved and usually shows normal responses. The caloric test will show more or less disturbance, with a difference in the irritability of the two sides. For example, marked or normal nystagmus on one side may follow minimal stimulation, with a normal reaction from the opposite side only after a maximum stimulation.

C. Disturbance of the vegetative nervous system. This is evidenced by normal or increased nystagmus, often associated with marked vertigo. The patient becomes either pale or flushed. The pulse rate and the breathing become affected. He shows extreme anxiety, pressure symptoms about the cardiac region, profuse sweating, general weakness, nausea, vomiting and fainting. These symptoms may last for some time, even several hours.

D. Syringobulbia. This is evidenced by constant vertigo, with pure or almost pure rotary nystagmus of the second or third degree to the affected side, a normal cochlea and normal or only slightly increased irritability of the vestibular system.

E. Disease of the central nervous system. Rare findings are associated with or accompany stimulation of the vestibular system, such as the maintaining of the head or the body in certain definite positions. The cause is unknown, and the site of the lesion is uncertain. There may be also disturbances of consciousness after stimulation of the vestibular system. These may be slight and transient or may occur with severe vertigo in diseases of the labyrinth. Epilepsy may fall in this class. Symptoms suggesting involvement of the cerebrum, such as headache, or of the extrapyramidal region, such as tremors of the head after stimulation, suggest central rather than peripheral lesions.

III. Vertigo. This is an important symptom of disease of the brain. However, the author does not believe that it is an evidence of intracranial pressure. It is usually an evidence of a vestibular influence, but it is difficult to differentiate between a labyrinthine and a central lesion.

The author then attempts to localize in the brain the lesions causing the various symptoms.

I. Vertigo. He disputes the contention of the neurologist that since vertigo is merely an expression of increased intracranial pressure it cannot be specifically localized. The author believes that vertigo occurs in the presence of increased intracranial pressure only when there is involvement by way of the internal auditory canal of the vestibular nerves or the labyrinth (stasis of the labyrinth). He has demonstrated that in many cases of increased intracranial pressure, marked compression of the brain stem and frank hydrocephalus evidence of vertigo did not appear.

A. The greatest degree of vertigo occurs when the root fibers of the vestibular nerve in the efferent nerve or the descending root and the arcuate fibers, which follow the nucleus to the posterior longitudinal fasciculus, are involved either directly or indirectly.

B. An isolated lesion of the posterior longitudinal bundle, in the region of the narrow vestibular system, can produce marked vertigo.

C. A lesion in the course of the ascending vestibular root fibers (the ipsilateral corner of the fourth ventricle) to its entrance into the nucleus angularis (Bechterew) leads to definite vertigo.

D. An isolated lesion in the nucleus vestibularis triangularis, at least in its dorsal portion, either unilateral or bilateral, does not produce any vertigo.

E. A lesion which unilaterally destroys the entire central vestibular system causes vertigo for a long time.

F. If the pathologic process reaches into the fourth ventricle, as hydrocephalus, a cysticercus cyst or involvement of the choroid plexus, it usually does not cause any vertigo. Vertigo occurs only when the vestibular system is involved directly by an encroaching process from above or there is involvement in the medulla. This is also true of any process occurring in the cerebellum. Here the disease must involve either the vestibular nerve or its tract.

G. A lesion in the midbrain does not produce vertigo, unless it encroaches on the narrow vestibular system. An involvement of the posterior longitudinal bundle in this region likewise does not produce vertigo.

H. What has been said of the midbrain under G applies also to the diencephalon and the root ganglion.

I. The author has been unable to find any positive evidence of a localization sign for vertigo in the cerebrum. This is in spite of statements in the literature that there are areas in the parietal and temporal lobes lesions in which are associated with vertigo.

II. Uniphasic reaction. This means that after stimulation either caloric or rotary, instead of true nystagmus, a slow component occurs, such as conjugate deviation of the eyes in the direction of the slow component. This may be due to interference somewhere in the ocular system.

III. No response from the vestibular system. The lesions usually occur in the pons, especially in the region of the posterior longitudinal bundles.

IV. Spontaneous nystagmus. Persistent rotary or horizontal-rotary nystagmus always suggests a central lesion. Spontaneous nystagmus in the direction of a dead labyrinth is always of central origin. This is especially true when vertigo is not associated. Postural nystagmus has been found in 40 per cent of 150 cases of tumor of the brain, and in 80 per cent of these the growth was in the posterior fossa. This definite localization has not been established. Hence, it is not of practical value.

V. Abnormal deviation of the head and body. The lesions have been found to be orad to the vestibular system, in fact, orad to the anterior corpora quadrigemina, at the level of the third ventricle. It is apparent also that a lesion in the frontal and temporal lobes of the cerebrum may produce this symptom. However. a positive diagnosis is not possible, but it is definitely known that the labyrinth, the vestibular nerve or its primary end organs and the brain stem are responsible for the phenomenon.

In summarizing, the author groups the symptoms as follows:

A. Symptoms arising from part of the acoustic nerve which suggest a lesion of the central nervous system.

1. Severe attacks of dizziness, which may be recurrent, in the presence of normal hearing.
2. Evidences of severe excitability of the vestibular nerve, either unilateral or bilateral, also in the presence of normal hearing.
3. Persistent spontaneous nystagmus in the presence of normal hearing.
4. Severe headache or an increase of preexisting headache occurring simultaneously with severe dizziness.
5. All forms of abnormal reactions previously described, especially preponderance of the slow component and any disturbance of the rhythm of nystagmus.
6. Postural nystagmus.
7. High grade nystagmus without dizziness or, if dizziness is present, with mutual independence of both symptoms.

B. Symptoms arising from the acoustic nerve which are signs of a lesion of the central nervous system.

1. Unilateral deafness and a dead cochlea plus spontaneous nystagmus to the same side.
2. Nystagmus continuing in the same direction unchanged for longer than a week.
3. Pure rotary nystagmus existing for a long period.
4. Vertical nystagmus of any form.
5. Unilateral or bilateral caloric unexcitability in the presence of normal rotary responses and normal hearing.
6. Uniphasic reactions.
7. Periods of deafness together with loss of consciousness.
8. Persistent changes of the posture of the head during examinations of the vestibular nerve, occurring at times in association with somnolence or sleep.

Under his last division, he presents a series of diagrams, presenting various lesions, which in turn elicited certain definite symptoms.

In conclusion, he emphasizes the desirability of close cooperation between the otologist and the neurologist, since a differential diagnosis often is impossible without such cooperation.

PERSKY, Philadelphia.

PETROSITIS AND HORNER'S SYNDROME. P. H. GERLINGS, Acta oto-laryng. **27**:561, 1939.

Gerlings presents 2 cases in which Horner's syndrome complicated petrositis. Serial sections of the temporal bone in 1 of the cases revealed infection and formation of an abscess in the peritubal cells and an actual abscess in the carotid canal. The Horner syndrome was caused by involvement of the sympathetic plexus in the carotid canal.

GROVE, Milwaukee.

Pharynx

SUBLINGUAL ABSCESS OF CITELLI. G. GIUFFRIDA, Arch. ital. di otol. **51**:293 (June) 1939.

Citelli established the fundamental characteristics of sublingual abscess which distinguish it from other suppurative processes of the mouth and neck. Sublingual abscess occurs in the loose connective tissue lateral to and beneath the

sublingual gland. The floor of this region is formed by the mylohyoid muscles, and they do not shut it off completely from the submandibular region. The fundamental symptoms of sublingual abscess are pain, difficulty of swallowing and mastication, dysarthria and tumefaction of the floor of the mouth, of part of the inferior surface of the tongue, of the median suprahyoid region and of the submandibular region. The swelling in the floor of the mouth is cordlike and is marked at the sublingual fold. It is distinguished from Ludwig's angina by being unilateral and involving the anterior part of the floor of the mouth and the under surface of the tongue. It is only in cases in which the process is not promptly treated that it extends to the suprahyoid region. Six cases are reported, in all of which a gram-positive diplococcus was found in the pus. In 2 cases the abscess was caused by puncture of the mucosa by vegetable fiber. Dental infection is a frequent cause of the abscess. The preferred treatment is by incision of the floor of the mouth and daily probing thereafter. The suprahyoid swelling does not subside immediately. It is well to wait a few days before determining the necessity of drainage by the external route.

DENNIS, San Diego, Calif.

THE OXIDE-REDUCING POWER OF THE TONSILLAR TISSUES. F. VENTURA-GREGORINA, Arch. ital. di otol. **51**:437 (Sept.) 1939.

Using the method of Birch, Harris and Ray (2, 6-dichlorophenolindophenol), Ventura-Gregorina studied the oxide-reducing power of tonsillar and adenoid tissue removed from 40 patients varying in age from 3 to 38 years. Especially considered was the relation of reduction oxides to the age of the patient and to the histopathologic structure of the tonsillar tissue. The results of the investigation indicate that when lymphatic hypertrophy is greater the oxide reduction is of higher value. In children up to the fourteenth year there is a greater degree of lymphatic hypertrophy than in adults and a larger extent of germinative centers, accompanied by a smaller quantity of stromal tissue. It also appears from the research that in the hypertrophic, chronically inflamed and hyperplastic tonsils, the important biologic phenomena of tissular respiratory activity progressively diminishes in relation to various complex factors, including, particularly, biochemical influences.

DENNIS, San Diego, Calif.

Nose

NASAL OBSTRUCTION CAUSED BY COLLAPSE OF THE NASAL ALAE. HAROLD I. LILLIE and KINSLEY M. SIMONTON, Ann. Otol., Rhin. & Laryng. **48**:600 (Sept.) 1939.

Alar collapse is a condition often not considered in looking for the cause of nasal obstruction. It is more frequently the cause than is generally recognized. It may be produced by overactivity of either the constrictor or the dilator muscles of the alae and is influenced by the negative pressure produced in the nose by inspiration. Other possible causes for the obstruction should be ruled out. In alar collapse the patient "breathes with the nose, not through the nose"; inspirations are short and quick; the alae are partly or wholly drawn inward. The effort of the patient to draw air into the nose increases the degree of medial motion while long, slow inspirations diminish the tendency to collapse. If a cotton ball tucked into the anterior superior recess of the vestibule gives complete relief, the diagnosis is made.

Some patients, when the cause of the obstruction is pointed out, will be able to correct the condition by correcting the air breathing. In some cases a cotton ball will be used; in others, a silver tube shaped to fit the vestibule. If simpler methods do not suffice, various surgical procedures may be tried.

M. V. MILLER, Philadelphia.

THE RATIONAL TREATMENT OF SINUSITIS IN CHILDREN. JOHN J. SHEA, J. A. M. A. **113**:10 (Sept. 2) 1939.

The author discusses the various forms of treatment of the sinuses. He reviews the local measures performed in the office, here and there adding a personal observation. Some comments are made on medicinal therapy, when to irrigate a sinus, questions of diet, climate, immunization, electrotherapy and surgical intervention.

He concludes as follows: 1. The rational treatment of sinusitis depends on a sane appreciation of the more recently discovered anatomic and physiologic facts, the result of clinical and experimental studies. 2. The treatment of sinusitis in children differs from that in adults in that the rhinologist hopes to terminate their infections or correct their allergic disturbances, thus obtaining a permanent cure.

GORDON, Philadelphia.

VOLUMINOUS PAPILLOMA OF THE NOSE, MAXILLARY SINUS AND NASOPHARYNX. G. SALVADORI, Arch. ital. di otol. **51**:356 (July) 1939.

The malignancy of nasal papillomas has been widely discussed. The opinion of Massione that papillomas are histologically benign but that in some cases the clinical course is malignant is not accepted. The patients do not have metastases or cachexia; the vigorous epithelial development of the tumor, the tendency to recur and the rich blood supply account for the apparent malignancy.

Salvadori believes that either the so-called malignant papillomas are papillary epitheliomas from the beginning (not thoroughly examined histologically) or, although initially papillomas, they have undergone malignant degeneration. In support of his views he reports 2 cases, 1 published in 1928 and 1 in this article. From a clinical point of view, both growths were benign, because there has been no recurrence; notwithstanding their long course (seven years and twenty years, respectively) and extensive development, there were only local symptoms of compression and no disturbance of the general condition. Histologically, the epithelium in 1 case was flat, with fibrous connective tissue and moderate vascularization; in the other case the epithelium was cylindric and the connective tissue was loose, edematous and rich in blood vessels. Both growths were pure papillomas, without atypical cells or karyokinesis and with a clear demarcation between layers of epithelium and of connective tissue. In pure papillomas, the sole factor that suggests malignancy is recurrence. Salvadori suggests that recurrence may be due to incomplete removal because the external method of operation was not used.

DENNIS, San Diego, Calif.

TRUNCULAR (BLOCK) ANESTHESIA OF THE NASAL CAVITY. GATTI-MANACINI, Arch. ital. di otol. **51**:495 (Oct.) 1939.

Gatti-Manacini describes the distribution of the nerve supply of the nasal cavity and the technic of injection of the nerve trunks. The sphenopalatine ganglion is approached through the posterior palatine canal and the anterior nasal (ethmoid) nerve through the orbit at the level of the anterior ethmoid foramen. The advantages of the procedure are complete anesthesia with a minimum of time, the use of a minimal amount of anesthetic and only a slight degree of shrinkage of the mucosa. When shrinkage and ischemia of the mucous membrane are required, a small amount of epinephrine solution may be applied locally. The method is indicated in all operations in the nasal cavity and the sinuses.

DENNIS, San Diego, Calif.

RHINITIS UNDER CONDITIONS OF SLEEP. H. TSUKAMOTO, T. HIRUGAWA and Y. KURITA, Monatschr. f. Ohrenh. **73**:380 (June) 1939.

With simple coryza, normal sleep under proper cover never produces the same increase of pathologic symptoms as does the horizontal position in the period of

wakefulness, viz., increase of the discharge, but, on the contrary, a relief. This may be caused by a diminution of the hyperesthesia, a decrease in the secretion and other effects of the heat-regulating mechanism of the body, which is affected by the steady environment of a warm bed. The decrease of glandular secretion in the nose and also in the larynx during sleep may also be the cause of morning hoarseness in acute dry laryngitis and of the increase of complaints in dry rhinitis after a night's rest.

LEDERER, Chicago.

Miscellaneous

END-RESULTS OF IRRADIATION OF THE THYMUS GLAND IN TWENTY-FOUR NORMAL INFANTS AND CHILDREN. C. G. KERLEY, Am. J. Roentgenol. **40**:416 (Sept.) 1938.

In 24 cases an attempt was made to determine the therapeutic results and absence of harm to mental or physical development of irradiation of an enlarged thymus.

The diagnosis was made by a roentgenogram of the chest and a history of sudden alarming attacks of dyspnea with cyanosis in an infant who otherwise was healthy.

In 21 cases the age at the time of treatment was less than 1 year. The weight and height of all the children except 2 were above the standards.

The author concludes that if the child is normal irradiation of the thymus produces no retardation of physical growth or of mental development.

SQUIRE, Chicago. [AM. J. DIS. CHILD.]

PROPHYLAXIS IN ALLERGY. R. A. KERN, Ann. Int. Med. **12**:1175 (Feb.) 1939.

After a discussion of the known facts relative to the production of sensitivity in those so predisposed, Kern offers as a means of preventing sensitization of the fetus in utero the avoidance of overindulgence in foods by the pregnant mother.

Prevention of sensitization to inhalants is accomplished by attention to the sleeping quarters, choice of toys, pets and furniture.

The importance of selecting a suitable occupation is urged on the allergic person.

Special care should be exercised in the selection of places for vacations with reference to plant pollination.

It is suggested that attempts at prophylaxis against hypersensitiveness should be made for the child with an allergic parent, for the person who has had allergic manifestations in the past, for the person who at present has some minor allergic symptom and for the one with obvious allergic disease.

It is estimated that 15 per cent of the white population of this country is allergic.

READING, Galveston, Texas. [AM. J. DIS. CHILD.]

THE ETIOLOGY OF TRAUMATIC MENINGITIS: A SURVEY OF NINETY CASES IN WHICH THE CONDITION WAS VERIFIED AT AUTOPSY. CYRIL B. COURVILLE and C. DON PLATNER, Bull. Los Angeles Neurol. Soc. **3**:150 (Dec.) 1938.

The cause and pathogenesis of pyogenic meningitis following trauma constitute a complex problem which involves much more than the direct extension of organisms into the cranial cavity through a fracture. Courville and Platner made a study of 1,261 cases of fatal craniocerebral injury, in 76 of which meningitis was discovered at autopsy, an incidence of about 6 per cent. This figure is in accordance with the observations of others on the incidence of meningitis following ultimately fatal injury to the head in civil life, although the percentage varies between 18 and 35 in war. Courville and Platner constructed the following classification of their cases on an etiologic basis: 1. Meningitis after basal fracture involving the nasal cavities, the sinuses or the auditory canal. In this, the largest

group, there were 61 cases, of which the fracture was in the anterior fossa in 31, in the middle fossa in 17 and in both the anterior and the middle fossa in 13. Only 4 of the 61 patients were female. 2. Meningitis after compound depressed fractures of the vault, 5 cases. 3. Meningitis after penetrating wounds of the skull, 3 cases. 4. Meningitis after injuries to the head without fracture, 9 cases. In this interesting group the path of invasion was usually not evident, but it seemed to be from an infected wound in the scalp, the nasal sinuses or the ear through emissary veins into the skull. 5. Meningitis secondary to traumatically precipitated sinusitis, otitis or mastoiditis, 4 cases. 6. Meningitis following injury to the spine, 2 cases. 7. "Metastatic" meningitis secondary to traumatically induced suppurative foci elsewhere in the body, particularly in the thorax, 5 cases. 8. Meningococcic meningitis precipitated by injury, 1 case. The possibility of tuberculous meningitis precipitated by injury is mentioned; no such case, however, was found in the series, and Courville and Platner consider its entity to be uncertain. They state that meningitis induced by trauma may be immediate, primary or direct, or delayed, secondary or indirect. Indirect or secondary meningitis follows some other suppurative intracranial lesion. Delayed meningitis is due to extension of infection through a fracture at least three weeks after the injury.

The treatment of this type of meningitis consists largely of prevention, in discussing which Courville and Platner mention adequate antisepsis of wounds in the scalp, gentle handling of patients, avoidance of irrigation or examination of bleeding ears, great care in exploring compound depressed fractures and the avoidance by the patient of blowing the nose, coughing, sneezing or straining. The patient should be kept on his back with his head slightly elevated. Administration of sulfanilamide is mentioned.

MACKAY, Chicago. [ARCH. NEUROL. & PSYCHIAT.]

LEPROSY OF THE UPPER RESPIRATORY TRACT: DISCUSSION OF EARLY AND MODERATELY ADVANCED CASES. F. J. PINKERTON, J. A. M. A. **111**:1437 (Oct. 15) 1938.

Pinkerton reviews his experience in Hawaii in the study of leprous patients for lesions in the upper respiratory tract. He states that practically every patient with leprosy has some nasal lesion due to the disease. Dryness, stuffiness, excessive crusting, blocking and epistaxis are common symptoms. The nasal bone is never destroyed, but the nasal cartilage commonly shows the typical depression at the tip of the nose; in a patient with syphilitic saddle nose the depression is due to destruction of the bony septum. The pharynx is seldom attacked. Nodules, leukoplakia and diffuse thickening may be lingual manifestations of leprosy. The tonsils were found to be affected in 20 per cent of cases, and in 40 per cent of cases of moderately advanced nodular involvement there were leprous lesions of some kind in the larynx. Huskiness may be an early symptom. In making a nasal "snipping" for bacteriologic examination, scraping hard enough to get some of the epithelium is essential, but one should not scrape hard enough to draw blood, as this interferes with the further examination. The scrapings are stained by the Ziehl-Neelsen technic. The favorite site for scraping is the septum, near the anterior border, or the side of the nose, immediately above the anterior end of the inferior turbinate. According to Pinkerton, more than 40 per cent of leprous patients with nodular lesions show a positive Wassermann reaction. With progression of the disease, the tendency to positivity of the reaction increases. In the neural types the Wassermann reaction is not specifically affected. Pinkerton has not observed any specific therapeutic effect from chaulmoogra oil U. S. P. Leprous lesions in the upper respiratory tract are best treated by measures to improve the general health, the use of bland oil sprays and hygienic care.

LEWIS, New York. [ARCH. DERMAT & SYPH.]

MENINGITIS CAUSED BY STREPTOCOCCUS HAEMOLYTICUS AND TREATED WITH SULFANILAMIDE. JOHN A. TOOMEY and E. ROBBINS KIMBALL, J. A. M. A. **112**:2586 (June 24) 1939.

The authors discuss in moderate detail their 12 cases of streptococcic meningitis and comment on several series of cases reported by others. The bibliography contains sixteen references.

Their procedure is "(1) to give a massive initial dose of . . . [sulfanilamide] followed at once by frequent maintaining doses, (2) to have the patient operated on as soon as possible for removal of the focus of infection and (3) to leave the hydrostatics of the spinal fluid alone unless the pressure is extremely high."

They stress the following point: "Sulfanilamide alone may prolong the life of the patient ill with streptococcic meningitis but it will not give complete cure if there is an unattended focus of infection." When the focal point of the disease was not recognized, the condition remained stationary.

They conclude: "Sulfanilamide is the therapy of choice in treating patients with beta hemolytic streptococcus meningitis. However, it is equally important to drain any localized area of infection by proper surgical procedures."

GORDON, Philadelphia.

Society Transactions

CHICAGO LARYNGOLOGICAL AND OTOLOGICAL SOCIETY*

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Regular Monthly Meeting, Dec. 4, 1939

Mucocele of the Frontal Sinus. DR. J. A. WEISS.

This article will appear in full in a later issue of the ARCHIVES.

Paralysis of the Abducens Nerve Associated with Sinus Thrombosis. DR. LEO A. SATZ.

When the patient, a white boy aged 13, was first seen, twelve days after a paracentesis on the right tympanic membrane, he complained of pain behind the right ear and in the zygomatic region and of right-sided headaches. The temperature on admission was 100.8 F. There was leukocytosis, the white cell count being 17,000.

The symptoms of sinus thrombosis were latent, and the paresis of the abducens nerve appeared ten days after an operation on the sinus.

Although some of the clinical symptoms along with the roentgenographic findings pointed to possible involvement of the petrous tip, the lack of continuous orbital pains, the moderate discharge from the wound, as well as the excellent healing tendencies throughout the entire period, the good physical condition of the patient and the late appearance of the paresis made the decision difficult.

The clinical picture, including the paresis of the external rectus muscle, could have been caused either by an osteitis in the petrous tip resulting from the diffusion of the infection in the tympanum along preformed anatomic pathways or by diffusion of periphlebetic changes along the inferior petrosal sinus, producing edema in the tissues surrounding Dorello's canal. The latter pathway, although rare, has been mentioned in the literature, especially as being the route followed in cases of abscess in the neighborhood of the sigmoid sinus. Considering that an inconstant paresis of the abducens nerve occurred after a sinus thrombosis and that low grade fever and leukocytosis persisted, it may be that involvement of the inferior petrosal sinus was responsible for the clinical picture. This and the absence of other threatening symptoms being kept in mind, surgical intervention was withheld.

DISCUSSION

DR. CARL CHRISTOPH: I should like to compliment Dr. Satz on his excellent presentation of a difficult case. In the differential diagnosis, meningitis, abscess of the brain and involvement of the inferior petrosal sinus or of the cavernous sinus were considered. The patient had two important symptoms of petrositis, headache and paralysis of the sixth nerve. The headache was deep seated and was not typically located behind the eye. The paralysis of the sixth nerve, while present, fluctuated in degree. It was a paresis rather than a paralysis. Thrombosis of the petrosal sinus seemed likely. The only explanation for the paralysis was on the basis of the edema.

* The program was presented by the members of the staff of the Illinois Eye and Ear Infirmary.

As for treatment, watchful waiting was considered the best course. The fact that the patient made an uneventful recovery showed the wisdom of being conservative.

DR. BENJAMIN BOSHES: This patient had a stiff neck, and the differential diagnosis between a stiff neck and a meningeal neck had to be made. Ordinarily, when a neck is meningitic the patient permits the examiner to rotate the neck from side to side. In this case when rotation of the neck was attempted the boy complained of pain. The absence of confirmatory signs, like the Kernig sign, further indicated that this was not a meningitic neck.

The second point was the nature of the invasion from the ear. The possibility of an abscess of the temporoparietal lobe or of an epidural abscess was considered. In the absence of choked disk, a space-occupying lesion could be excluded. The absence of a hemianopic defect ruled against a lesion in the temporal lobe. There was no adiadokokinesis. The presence of a palsy of the sixth nerve suggested a lesion within the cranium. If it had been an intrapontile paralysis it would have picked up the seventh as well as the sixth nerve. Pain in the anatomic distribution of the fifth as well as the sixth nerve spoke for a lesion at a point where the two are contiguous. Consequently, the impression was that the anomaly was what the neurologist calls the "paratrigeminal syndrome," a lesion located in juxtaposition to the ganglion of the fifth nerve. Since the impression was that there was no abscess or space-filling lesion and that meningitis was not present, it was concluded that the lesion must be local, near the tip of the petrosa.

I think the differentiation between "stiff" neck and true meningitis neck has value, because many times a patient is so sick that one is reluctant to do a spinal puncture. Such small signs are useful in the differential diagnosis.

Complication of Caldwell-Luc Operation. DR. BERNARD M. COHEN.

A Negro woman aged 40 entered the clinic in 1937, complaining of frontal headaches and of aching in the teeth off and on for the past thirty years. Several irrigations of both maxillary sinuses were performed, and she did not return until 1939, when she had a recurrence of these symptoms, the pathologic condition being most marked on the left side. Roentgen studies of the sinuses showed extensive cloudiness in the antrums and hypertrophic mucosal changes, noticeable most on the left side. Irrigation of the left maxillary sinus failed to produce improvement.

On May 15, 1939, a Caldwell-Luc operation was performed on the left side; a great deal of polypoid tissue was removed from the antrum, and a counter-opening was made into the nose in the inferior meatus and a rubber tube drain inserted.

The early postoperative condition was satisfactory except for severe pain in the left side of the face referred particularly to the preauricular region. On the fourth postoperative day the patient had a chill and a temperature of 104 F. The following day a definite circumscribed swelling of the parotid gland developed, associated with redness and marked tenderness. (The antral washings continued clear.) A diagnosis of surgical parotitis was made and roentgen treatment given over the swollen area.

The fever continued, a slight fluctuation developed in the parotid gland, and on the eleventh postoperative day the gland was incised and searched in vain for pus. In forty-eight hours, however, there was profuse drainage of foul material from this incision and a bulging of the left side of the soft palate and of the lateral pharyngeal wall was found. This swelling was incised and the same foul pus encountered. Subsequent irrigation through either incision caused a flow through the other incision; the diagnosis of infection of the pharyngomaxillary fossa was therefore established. For the next three days fever subsided and the condition improved, but the fever soon recurred. On the twenty-first postoperative day an incision was made along the left sternocleidomastoid muscle, the carotid sheath exposed, the pharyngomaxillary fossa entered and pus drained. The internal jugular vein was ligated and cut.

The temperature gradually returned to normal, and progress was satisfactory. However, on the thirty-second postoperative day a fluctuant swelling developed in the midline of the neck just above the sternal notch. This was incised and foul pus encountered.

Subsequently, all incisions healed, with subsidence of drainage. The patient had no complaints. On the fifty-third postoperative day she was found in a deep stupor, having a temperature of 104 F. and a pulse rate of 132. The neck was rigid. The Babinski and the Kernig sign were positive. The spinal fluid was under increased pressure and was cloudy; the cell count was 1,200, with polymorphonuclears predominating. Within a few hours, the patient lapsed into a deep coma and died.

The patient in this case presented suppurative surgical parotitis following the Caldwell-Luc operation, with the products of inflammation breaking through the deficient portion of the parotid fascia. This produced infection of the pharyngomaxillary fossa, and the infection descended and ascended from the original site. Descent was adequately halted by the surgical procedures, but the ascending infection to the meninges caused the fatal termination.

DISCUSSION

DR. SAMUEL SALINGER: Why was the parotid gland invaded in the first place? It seems more than likely that the infection was transmitted by direct extension either through the original incision or through Stenson's duct. Usually in doing a Caldwell-Luc operation one forgets the parotid gland, but it can be easily traumatized, especially by too vigorous application of retractors. Once the infection enters the parotid gland it can pass to the pharyngomaxillary space, which is in close apposition to its medial surface. Only last summer I observed a case of parotid infection following a pelvic operation; in that case there was a subsequent terrific infection of the pharyngomaxillary sinus, which was drained by the Mosher procedure. Once the infection has reached the pharyngomaxillary space it can invade the carotid sheath and proceed thence down to the sternum, as it did in Dr. Cohen's case. An ascending infection is less frequent but can take place by way of the carotid artery or the pterygoid venous plexus. This is the first time I have seen a complication of the type, and I believe it interesting enough to be placed on record.

DR. JOSEPH BECK: Dr. Salinger called attention to the fact that infection of the parotid gland is reported, but the anomaly is not well known to most otolaryngologists; particularly unfamiliar is the point that Dr. Salinger made regarding trauma from retractors. I had a patient with paralysis of the facial nerve following an operation of this type, and I believe that the condition resulted from the use of retractors to get to the back part of the antrum in the removal of the osteal wall.

In cases in which general surgical procedures are employed, infections go to the parotid gland or from the parotid gland to the rest of the body, especially after gunshot wounds. Many cases, notably that of President Garfield, have been reported in which infection of the parotid gland followed a gunshot wound. I think Dr. Cohen's presentation is valuable, and since the Caldwell-Luc operation is so frequently done attention should be called to the possibility of trauma.

Nasopharyngeal Tuberculosis. DR. F. PISZKIEWICZ.

C. B., a Negro youth aged 17, was admitted to the outpatient clinic on Sept. 11, 1939. He gave a history of bilateral deafness and tinnitus of about nine months' duration, stating that about nine months ago a swelling on the right side of the neck started as a small painless nodule which gradually grew in size to that of a walnut and then ruptured spontaneously and discharged a thin whitish fluid. This sore remained open and discharging for about two weeks, became crusted over and healed. About one month after the appearance of the swelling in his neck he noted that his hearing began to fail. The hearing loss developed rapidly and to such a marked degree that he was compelled to leave school.

On examination the right ear drum appeared thickened and reddened and the left external auditory canal contained some yellowish white discharge, which seemed to be coming from a small anterior perforation in the ear drum. There was an asymmetric enlargement of the posterior cervical lymph glands, the right chain being larger and less discrete. There was no tenderness or fluctuation, and on the right side of the neck the skin presented two small dimpled scars. The tonsils were moderately enlarged. The soft palate, uvula and anterior pillars were infiltrated and of a leathery consistency. The posterior pharyngeal wall contained several enlarged, raised, reddish masses of lymphoid tissue. Digital examination of the postnasal space showed it to be narrowed and containing a soft spongy mass which bled easily.

The blood count was normal. The hemoglobin value was 91 per cent. The Wassermann reaction of the blood was negative. The Mantoux test elicited a strongly positive reaction. There was bilateral deafness to the ordinary conversational voice; the limit for the lower tones was 256 cycles and for upper tones 1,024. Stimulation of both labyrinths by cold alcohol resulted in normal responses. A biopsy of the nasopharyngeal tissue was reported as revealing tuberculous granulation tissue. Roentgen examination of the chest showed no abnormal findings. The cervical vertebrae appeared normal on roentgen examination. Specimens of sputum were repeatedly normal when examined for tubercle bacilli. The patient was referred to the tumor clinic, where he received small doses of roentgen radiation for twelve days, a total of 66 roentgens being given.

Reexamination three weeks after the administration of roentgen therapy showed an almost complete absence of lymphoid tissue in the mouth and pharynx and no mass in the nasopharynx. The soft palate was thickened and leathery hard, and the regions of both eustachian orifices were firm and infiltrated. The hearing showed no material improvement, and the left ear was moist. After the original biopsy, more tissue was removed for further study and for guinea pig inoculation. Smears of this tissue failed to reveal tubercle bacilli.

Conclusion.—This is a case of nasopharyngeal tuberculosis associated with bilateral lymphadenitis, probably tuberculous, and bilateral deafness. No pulmonary or tracheobronchial tuberculous lesion could be demonstrated. Further studies are being carried out to determine the nature and type of tuberculosis.

DISCUSSION

DR. ALFRED LEWY: This patient was sent to the tumor clinic in the belief that the disease was nasopharyngeal fibroma, because I thought the mass felt hard. A report on the guinea pig inoculation is not yet available. The slide appears characteristic. The boy's general condition is much better. He has grown 3 inches (7.5 cm.) in height, is much heavier and has a great deal more energy than when I first saw him. It is not known where this tuberculosis originated, whether it arose in the cervical glands and then by a retrograde process appeared in the nasopharynx, or whether it began at another site. The loss of hearing suggested that the infection of the middle ear may also be tuberculous. This loss of hearing was rapid. I shall know more about the patient after the study of the guinea pig inoculation is complete.

DR. FRANCIS L. LEDERER: The epipharynx is seldom the site of primary tuberculosis, and when the lesion is in this area there is usually chronic pulmonary tuberculosis. This particular area is of significance from a diagnostic and therapeutic point of view, for often it, as well as the pharynx, is a focus for reinfection of the ears, since the lymphatic tissue of the epipharynx is part of Waldeyer's ring. This patient had cervical adenitis, a remnant of the old scrofulous type of infection. In a number of patients with this condition fistulous tracts have formed, going back into the nasopharynx and communicating with the adenitis, which is the primary source of infection. A more complete history might establish the fact that it is an acid-fast type of infection, as Dr. Lewy intimates. Osteomyelitis of the cervical part of the spine on a tuberculous basis is also a possibility.

This case proves again what has been emphasized in the past, namely the necessity of close observation of the epipharynx as a source of tuberculosis. There are two types of tuberculosis observed at that site. The first is the more chronic type. The second type usually seen in this area is the miliary form of tuberculosis associated with the laryngeal form when the pulmonary tuberculosis is primary. These conditions often accompany tuberculosis in Peyer's patches of the intestines. Tuberculous enteritis develops in association with this particular condition. However, I believe that this case cannot be looked on as one of primary tuberculosis of the nasopharynx but should be considered as a case of tuberculosis secondary to cervical adenitis.

DR. SAMUEL SALINGER: The condition in this case presented a typical triad of symptoms which might lead one to believe it malignant. The patient had aural symptoms, a mass in the nasopharynx and enlarged cervical glands. Two facts, however, would rule out carcinoma: First, the symptoms developed rapidly; second, the lymph glands broke down early. These never occur in cases of malignant growth. The only other condition that might behave the same way is actinomycosis. It is speculation to try to figure out whether the infection was primary in the nasopharynx or secondary to an infection of the cervical glands. I am more inclined to believe that this patient had an old primary tuberculosis in the chest and that the nasopharynx was involved by metastatic infection together with secondary invasion of the glands.

Two Cases of Labyrinthitis. DR. FREDERIC J. POLLOCK.

This report covers the cases of 2 patients who had labyrinthine involvement associated with otitis media.

The first patient was a man aged 35 who complained of deafness and tinnitus in the right ear for six weeks. Eleven days before his admission to the clinic a postauricular swelling developed and there was discharge from the right ear. The tympanum was intact, but there was a fistula in the posterior wall of the external auditory canal. The distance at which the voice could be heard was reduced to 1 foot (30 cm.). The Rinne test elicited a negative reaction, and in the Weber test the sound was lateralized to the affected ear. Rotation tests showed that both labyrinths were normal. The Wassermann reaction of the blood was negative.

Although external otitis with a postauricular abscess was suspected, the roentgenogram showed extensive destruction in the mastoid cells. A simple mastoidectomy was done; a fistula was found in the cortex and another in the posterior wall of the external auditory canal. A pneumatic mastoid process was observed, with broken-down cell walls and filled with granulations. Culture showed a mixture of organisms, with Staphylococcus overgrowing the others.

Recovery was uneventful, except for continuance of a postauricular discharge. Five weeks later, while still under care, dizziness, headache, nausea and vomiting developed, as well as tinnitus followed by deafness, horizontal rotatory nystagmus of a second degree to the opposite side and past pointing. There were no signs of meningeal involvement. The temperature was 99.2 F. Caloric tests showed a dead labyrinth on the affected side. A lumbar puncture revealed 20 cells, of which 90 per cent were lymphocytes. The pressure of the spinal fluid was normal. Administration of 90 grains (5.4 Gm.) of sulfanilamide daily was begun, and the following day the temperature became normal and the nystagmus considerably less marked; the patient felt much better. Another lumbar puncture two days later showed 15 cells. The administration of sulfanilamide was continued in doses of 60 grains (3.6 Gm.) daily. The patient continued to make an apparent improvement.

Ten days after the onset of the labyrinthitis, a temperature of 104 F., a severe headache and a stiff neck suddenly developed. Lumbar puncture showed 3,500 cells, and a culture revealed streptococci. A roentgenogram showed no involvement of the petrous apex. A radical mastoidectomy was done, the semicircular canals

were opened, and the wall of the promontory was broken through. The patient died four days later. No autopsy permit was obtained.

The second patient was a man aged 26 years, who had had a purulent discharge from the left ear since he was 1 year old. For ten days before admission he had noted a dull pain over the left mastoid process, and for three days he had had vertigo and nausea. The temperature was 100 F. A spontaneous second degree nystagmus to the right was noted. Examination showed an almost complete obstruction of the drum, as well as a middle ear filled with granulations; roentgen studies revealed a large cholesteotoma. Hearing in the affected ear was limited to conversation on contact, with masking of the other ear. In the Weber test the sound was lateralized to the good ear. The fistula test did not increase the nystagmus. There were no signs of meningeal involvement. A Wassermann test of the blood gave a negative reaction. Conservative treatment was given, and the temperature gradually returned to normal. All hearing disappeared, except that by bone conduction. A slight facial weakness became apparent. The dizziness and nausea disappeared, and nystagmus could no longer be elicited. Three weeks after the onset of the labyrinthine storm, rotation tests showed a dead labyrinth and all hearing, both by ear and by bone, was gone. The patient was discharged from the hospital.

Nine days later he was again admitted, because of headaches and elevation of temperature. A lumbar puncture showed 70 cells, mostly lymphocytes, and there was a positive reaction to the Pandy test for globulin. A Wassermann test was reported as giving a 4 plus reaction, and the Lange gold curve indicated tabes dorsalis. Antisyphilitic therapy was instituted. Two months after this treatment was begun, all symptoms cleared up and the spinal fluid showed 24 lymphocytes and a negative Wassermann reaction but a positive gold curve.

This patient was last seen on Nov. 21, 1939, about eleven months after he first came under observation. He still had a foul discharge from his left ear. Hearing was completely gone, and no response could be elicited from irrigation of the ear with ether.

Comment.—These two cases had certain points of similarity. In both, there were a dead labyrinth and a spinal fluid cell count above normal. The first patient had no discharge from the middle ear, yet a mastoid suppuration developed. This infection eroded the cortex and the posterior canal wall.

DISCUSSION

Dr. M. A. Glatt: It is often difficult to differentiate clinically the serous from the purulent type of labyrinthitis or to foretell whether the pathologic process in a latent type is fibrosed or is lingering.

In the first case, in view of the improvement in symptoms and decrease of spinal fluid cells, it appeared that recovery might take place and conservative treatment was justified. On the other hand, when one considers the late onset of the labyrinthine symptoms in a case of acute suppuration of the middle ear associated with an intact ear drum, followed by an atypical form of mastoiditis, then one realizes that the prognosis was grave and may assume that probably an earlier exploration of the labyrinth was indicated.

The condition in the second case is an example of the circumscribed type which gradually progresses into a latent form of labyrinthitis. The history of a chronic aural discharge and the mild recurrent attacks of labyrinthitis offered a better prognosis. The delay in performing the mastoid operation was due at first to the acute exacerbation of the otitis and then to the discovery of an associated syphilitic infection and to the patient's refusal.

At the time of operation the management of the labyrinth depends on the findings. If intact, it should be left alone. Should signs of meningeal irritation arise postoperatively, immediate exenteration of the labyrinth is indicated. However, when it is found that the cholesteatoma has invaded the labyrinth capsule or when the removal of granulation tissue will uncover the labyrinth, then the latter should be exenterated at the same time.

The conservative or the radical management of labyrinthitis in a particular case depends on many factors, such as (1) cause, (2) a history of trauma or infection, (3) whether there is associated acute or chronic suppuration of the ear, (4) the condition of the mastoid process and the contiguous structures, particularly the bony labyrinth at the time of operation, and (5) the findings of the cerebrospinal fluid.

DR. HANS BRUNNER: I have not seen this patient and can speak only about labyrinthine operations in general. When I began the practice of otolaryngology many labyrinthine operations were being done. Later the number decreased, and in the last years sometimes many months passed without one being done in our clinic. This decrease in the number of labyrinthine operations is not limited to my own experience. The fact must be borne in mind that there is a difference in the development of chronic otitis and in that of chronic labyrinthitis. Chronic otitis media is progressive as long as it is present. The tendency for spontaneous healing is but little marked when the bony walls of the ear are affected. This is not true of labyrinthitis, which has a great tendency to heal spontaneously even when tuberculosis in other organs is present. Consequently chronic labyrinthitis does not call for surgical treatment. Since acute labyrinthitis is also not a surgical condition, it may be said in general that chronic as well as acute labyrinthitis per se is not surgical.

It is a matter of personal choice whether to operate on a diseased labyrinth, but there is no question as to the necessity of a labyrinth operation when the labyrinthitis is complicated. The signs for such developing complications are: fever, changes in the eyegrounds and changes in the blood count and in the results of spinal puncture. In such cases a thorough labyrinthine operation must be performed, the approach being from the posterior fossa.

In Dr. Pollock's first case the labyrinthine operation was indicated because the patient had an elevation of temperature. Whether such an operation should be performed in the second case cannot be answered positively, but the operation would seem to me to be indicated.

Unusual Roentgen Studies. DR. J. H. GILMORE.

Roentgenographic studies of the following unusual cranial conditions are shown, obtained from 3,580 examinations of the sinuses and 1,671 examinations of the mastoid at the Illinois Eye and Ear Infirmary since July 1, 1933:

CASE 1.—Mucocele of an eccentrically lateral-lying frontoethmoid cell which had eroded into the orbit.

CASE 2.—Large osteoma occupying the entire left anterior ethmoid region.

CASE 3.—Large osteoma of the antrum completely filling the sinus and involving the superior maxilla.

CASE 4.—Rhinolith forming a complete cast over one inferior turbinate bone.

CASE 5.—A giant cell tumor of the mastoid process, demonstrating by roentgenographic appearance the difference between neoplastic and inflammatory bone destruction.

CASE 6.—A large cholesteatoma of the mastoid process, demonstrating the value of Towne's position as an aid in such diagnoses.

CASE 7.—Suppuration of the petrous apex observed with the patient in the Taylor position, with subsequent examination demonstrating sclerotic reparation.

CASE 8.—Syphilitic osteomyelitis of the skull on a congenital basis in a woman aged 24, demonstrating two years after treatment almost complete repair of damage.

Experiences with Endaural Complete Mastoidectomy and Atticomastoidectomy. DR. ROBERT HENNER.

The purpose of this report is to discuss some experiences since April 1939, during which time 39 endaural procedures were performed. Of these there were

16 simple, or complete, mastoidectomies; 2 modified radical mastoidectomies, or atticomastoidectomies; 20 radical mastoidectomies, or mastoidotympanectomies, and 1 fenestration operation for otosclerosis.

The stages and procedures involved in the operations are discussed briefly.

Sixteen simple, or complete, endaural mastoidectomies were performed. The ages of the patients ranged from 3 to 60 years. Their average postoperative stay in the hospital was eleven and one-half days. There were 4 cases of subperiosteal abscess, 4 of tip abscess, 2 of extensive retrosinus necrosis and 1 of extradural abscess in the zygomatic area. In this case the patient, a boy aged 8 years, had marked zygomatic swelling, a temperature of 104 F. and toxemia. During the mastoidectomy, on exposure of the zygomatic cells, about a half-ounce (15 cc.) of yellow, creamy pus gushed forth under pressure. Dural granulations were exposed and cleaned, and because the squamosal portion of the temporal bone about this area appeared necrotic a portion of bone 5.5 cm. in diameter was removed. This patient had an uneventful postoperative course and left the hospital on the thirteenth postoperative day. Two patients with perisinal abscess associated with granulations on the sinus were operated on. No instances of lateral sinus thrombosis were encountered. However, in 1 routine simple mastoidectomy, the lateral sinus was accidentally perforated while the sinus plate was being skeletonized. The hemorrhage was controlled with a small pack, and the operation was completed through the endaural window without difficulty. The postoperative course was uneventful, and the temperature never rose over 98.8 F. In 1 patient, aged 60 years, bronchopneumonia developed on the eighth postoperative day. This was followed by an erysipeloid infection about the ear on which operation had been done; that condition responded to treatment with sulfanilamide, and the patient was discharged on the thirty-third postoperative day. In 1 case of postauricular fistula, a revision of the mastoidectomy was performed endaurally and the sinus tract everted, but the primary suture of the fistula sloughed; however, it did heal by secondary intention. In another case, within two days postoperatively edema developed over the zygoma. This subsided, but immediately granulations began to spring up in the external canal, and at present the entire canal is stenosing. This occurred as a result of accidental perforation of the posterior membranous canal. In this case it is about five weeks since operation. A plastic operation will be done on the canal at a subsequent date. The condition in the remainder of the cases was the usual coalescent mastoids.

As for the external ear after the endaural complete mastoidectomy, the results are satisfactory. Occasionally when healing has been slow a small antauricular scar may be observed. There have been no cases of perichondritis, collapse of the canal or stenosis, other than the case cited. The endaural approach in the complete mastoidectomy can be performed by an experienced operator, so that every type of pathologic condition of the mastoid can be dealt with adequately. Further, this approach preserves the principle of wide open drainage and permits daily inspection of the mastoid cavity. Since healing occurs from the bottom out, there is no necessity for constant probing to the antrum, and there is no sealing off of a traumatic infection. The postoperative course of these patients has been free of any serious morbidity. Another point to consider is that delayed healing and retroauricular fistula offer no problem, as they do in cases in which the postauricular operation is used. Furthermore, since the attachments of the sternocleidomastoid muscle are uninjured there is little postoperative pain in the neck. The differential diagnosis of meningitis is therefore easier. The only practical difficulty encountered has been that in a few of the cases in which the disease was in an early stage, particularly when there was edema of the skin, exposure of the tip was difficult.

Experience thus far with the atticomastoidectomy shows that the endaural operation for the atticomastoidectomy, or modified radical mastoidectomy, is a procedure of great merit.

Observations on the Endaural Mastoidotympanectomy of Lempert. DR. GEORGE WOODRUFF.

In the work on this series the attempt has been to do a complete mastoidectomy and to follow Lempert in his removal of all tissue in and about the middle ear which might harbor disease. The results to date are encouraging.

The incisions are more difficult than is the postauricular incision, especially for a novice. The execution demands thorough knowledge of the descriptive details plus a practical knowledge of the structure of the membranous and bony canal walls. Adequate practice on the cadaver is necessary to overcome these difficulties.

With a little practice one is able to work well through the space afforded by the endaural approach. However, it should be emphasized that a good working knowledge of surgical anatomy and practice on the cadaver are even more important than in radical surgical procedure by the usual route.

After the completion of the simple mastoid operation, Lempert's method in his thorough work in and about the middle ear has been followed. This technic is as follows: First the posterior canal wall is lowered to the level of the facial ridge and the ridge is further brought out by thinning the canal wall from both the canal and the mastoid side. The bridge of bone is removed by inserting the perforating burr beneath it and burring gently outward. The external attic wall is taken out and is moved up to the level of the skeletonized dural plate of the middle fossa and forward until it is flush with the sloping anterior wall. The annulus tympanicus is removed anteriorly, inferiorly and posteriorly, and the anterior wall of the middle ear is thinned, the mouth of the tube, the hypotympanum and the region of the stapes and oval window thus being brought into view. The hypotympanic cells are thoroughly broken down until the floor over the jugular bulb is smooth and the promontory well outlined. The processus cochleariformis is fractured and removed and the tensor tympani muscle evulsed, and any cells about the opening of the tube are curetted out. When necessary the floor of the canal is lowered enough to give a good view of the hypotympanum.

No serious complications have been met, and none that could be charged to the technic.

In 17 of these cases the condition had been diagnosed as uncomplicated chronic purulent otitis media. Of the others, in 1 there was diffuse purulent manifest labyrinthitis. The patient was hospitalized for three weeks, and when all active symptoms had subsided the operation was performed. A fistula was found in the horizontal canal. The postoperative recovery was uneventful. Today the ear appears to be dry, but there is considerable narrowing deep in the canal, though an applicator easily passes through it.

In another case the patient had diffuse serous labyrinthitis, the symptoms of which disappeared after rest in bed. An endaural mastoidotympanectomy was performed sixteen days after admission. At operation a fistula was found in the external canal. The convalescence was uneventful except that there was considerable difficulty in keeping the canal from becoming constricted.

In the third case a diagnosis of circumscribed labyrinthitis was made. Recovery was without any untoward incident.

In 2 cases the present condition is unknown. In 2 others operation has been done too recently to warrant judgment of the result. Of the remaining 16 cases, the patients in 11 have dry ears and in 5 varying degrees of discharge. In general the healed cavities are much smaller than those found after the usual radical mastoidectomy, and the epidermis is considerably thinner and seems to have less tendency to desquamate.

In some cases there has been difficulty in controlling the healing process. This is especially true of those in which the after-care was given by some one not experienced in cases in which radical mastoidectomy had been done. In some instances the middle ear seems to have become obliterated, and in a few considerable constriction of the canal has occurred; in 1 or 2 a false membrane has formed across the canal.

No special claims are made for this operation or for the results. The presentation is given as an example of the results obtained after a fairly good trial of the Lempert endaural mastoidotympanectomy.

One of the advantages is that a better view of the middle ear is afforded than is obtained in the usual operation. However, the postauricular radical operation can be modified to give approximately the same view. The canal incisions are included in the initial incisions and afford a good view of the middle ear and canal region throughout the whole operation. Another merit is that there is no plastic work to be done on the canal, and no sutures are necessary at the end of the operation. Furthermore, these patients have less postoperative pain. They can usually be out of bed earlier and are able to leave the hospital one or two days sooner. The soft tissue covering of the postauricular area is not weakened, and there is little likelihood of retroauricular fistula.

The disadvantages are the difficulty of the incisions and the necessity of working in a smaller field.

Whether to adopt the endaural route for mastoidotympanectomy must be decided by the individual operator. A surgeon who is not willing to perfect himself in the method by work on the cadaver should probably continue with the postauricular route.

Perhaps the most valuable by-product of Dr. Lempert's work in the perfection of his various endaural procedures, especially, of course, the fenestration operation, is the reawakening of interest in otologic surgery. He has done more to stimulate knowledge of the surgical anatomy of the temporal bone than any one has done for decades.

DISCUSSION

Dr. George E. Shambaugh Jr.: I have used the endaural approach for all radical mastoidectomies and for some simple ones for a year. For the simple mastoidectomy I am not sure the advantages are great. For radical mastoidectomy I think eventually the endaural will replace the postauricular approach. Operation is done via a route where the cavity has to be kept cleaned, and that means that it will be accessible for future care. It is important that the incision be kept wide open until epithelization is complete. After the postauricular operation I have had perichondritis of the auricle develop in 2 cases. I think the endaural approach will obviate this complication, since the incisions are entirely extracartilaginous.

Dr. Thomas C. Galloway: For about a year and a half this operation has been used rather frequently at Cook County Hospital. My conclusions are much the same as those Dr. Shambaugh has given. One can do a simple mastoidectomy endaurally, but in the presence of suppuration of a lateral sinus or occasionally a subperiosteal abscess it is sometimes more difficult to reach all areas of disease. I feel rather sure that the occasional operator performing simple mastoidectomy will do better if he uses the classic approach.

I think the presentations of Drs. Henner and Woodruff deserve a great deal of credit, because these demonstrations lead to much more refinement in technic and anatomy.

For a modified radical mastoidectomy one can hardly imagine a finer technic than this operation offers. As this technic is developed more operations are going to be done without sacrificing the contents of the middle ear. However, there are difficulties. In the first series of cases, because the incision was not carried high enough and a good exposure was not obtained, some stenoses of the canal resulted. Now they rarely occur.

Dr. Joseph Beck: Some of the men present have used the electrotrephine burr; Dr. Boettcher, who is one of the pioneers, employed it for mastoid operations. That instrument is now being used, and in teaching the use of it one should teach as well the structure of the temporal bone. Dr. Lempert has been working on this method for many years, and numbers of men throughout the country have followed him. The possible complications will be discussed a little later. Dr.

Shambaugh brought out an important point about perichondritis. If there is no difficulty with the cartilage in the postauricular operation, I should say that in cases of acute infection of the mastoid there would be more difficulty in operation by the endaural route. In the cartilaginous part of the canal and the presence of a very virulent infection I think the chances are greater for infection in the neck than with the incision made by the retroauricular method. What this operation will bring when used in cases of acute mastoiditis is still to be seen.

For the semiradical operation that Dr. Henner reported I think that the endaural approach is excellent and that it will give better results and permit better after-treatment than the old method. Why should there be a difference in this operation in the formation of epithelial debris, for the cavity will become lined with some type of modified epithelium as in the radical operation done by the postauricular approach?

An important subject not dwelt on by the discussers is the eustachian tube. I have observed some cases in which operation was done by this method, and there is a better approach to the tubal cells as well as a subsequent closing off of the eustachian orifice. I can cite no case in my experience of radical mastoidecomy in which an occasional cleaning out of the debris which forms in the cavity is not necessary. If this method will reduce that debris to the point where there is a smaller cavity or a reformation of bone, and if some of the patients in these cases come to the autopsy table for another reason than an aural condition, the temporal bone will be found healed. I am looking for such proof of what the Lempert operation will do.

Dr. Samuel Salinger: I wish I could share the enthusiasm of Drs. Henner and Woodruff with regard to the use of the endaural method, even admitting a number of points in which the endaural approach is superior to the retroauricular. When I think of the history of endaural mastoid surgery (it goes back to 1875) and consider the vicissitudes through which it has passed and the critical examination to which, having been tried and then generally abandoned, it has been subjected in all European centers, I cannot help but feel that it has been taken up on this side with perhaps too much enthusiasm. Babbitt in Nelson's Loose-Leaf Surgery gave an excellent résumé of the history of this procedure. It would be instructive to those who contemplate adopting this operation to read the reports of Thies, who recorded 1,500 cases of endaural operation, with only 1 failure and 1 fatality. Yet although it was taken up by Van Eiken, he admitted later that he had to give it up. Other men tried various modifications of this approach, and most of them finally abandoned it in favor of the retroauricular one, particularly in cases of acute infection. There is one thing I cannot understand in the technic of the endaural radical mastoidectomy. When a postauricular radical mastoid operation is done, particular care is taken to preserve the membranous canal for the plastic procedure. In the operation under discussion a great deal of this same tissue is removed and discarded, the dehiscence then filling in with scar tissue. I admire the enthusiasm of Dr. Henner and Dr. Woodruff and believe that their report will stimulate interest in the technic as well as a more intimate knowledge of the detailed structure of the middle ear. However, if they mean to convey the impression that the endaural approach should supplant the retroauricular approach, I should take issue with them, particularly in relation to the cases of acute infection. One of them mentioned that when operation is done by the endaural approach the cavity epithelizes from the bottom up. This is a distinct disadvantage as compared with the retroauricular operation, in which the drainage is naturally at the most advantageous point, namely, the lower end. On the other hand, if the endaural approach is employed in the case of a sclerotic mastoid process, in which there are no mastoid cells and in which the object is to clean out the mastoid antrum and the middle ear, I can see that this method will save the patient a great deal of pain and discomfort.

Dr. M. A. Glatt: It has been stated that the endaural approach is suitable for the radical mastoid operation but that it has no advantage over the postauricular approach.

I have performed all my radical mastoidectomies by using Stake's method of approach, that is, by taking down the posterior canal wall at a sufficient depth, which easily exposes the mastoid antrum. A small cavity, which does not require long postoperative care and leaves no postauricular depression, is thus obtained.

The endaural approach may produce much cleaner cavities because a large portion of the membranous canal that has hairs and ceruminous glands is discarded, desquamation which would otherwise take place thus being eliminated. The epidermis that covers the new cavity is better nourished because it advances over a thick layer of granulation tissue. This feature can be easily duplicated by the postauricular approach. To become proficient with the endaural method requires many hours of training in the use of a dental drill and the various sizes of burrs. The smaller the burr the more dangerous it is. In the endaural method one works mostly with small burrs. It is therefore difficult to introduce it as a routine method to the intern staff.

I can see the advantage of the endaural approach as a step forward in the surgical treatment of otosclerosis or petrositis, and as such it is to be encouraged.

Dr. George Woodruff: Dr. Shambaugh and Dr. Galloway appear to hold substantially the same opinions that we do on the operations under discussion.

This presentation of cases has been made to give an idea of the results we have obtained using the endaural approach. We are not attempting to say that these methods should be universally adopted. At present we are more favorably impressed with the endaural route for mastoidotympanectomy and atticomastoidectomy than for complete mastoidectomy. Our results of mastoidotympanectomy since adopting this technic are undoubtedly greatly improved. However, we intend to go on doing all mastoid operations in our service through the endaural route at least until April 1, 1940, which will make more than one year during which all surgical procedures on the mastoid, with the exception of those performed in 2 cases, have been done by the endaural route. I believe that Dr. Henner and I both hold the opinion that the advantages of endaural mastoidotympanectomy and endaural atticomastoidectomy definitely outweigh the disadvantages. Concerning complete mastoidectomy we prefer to reserve our judgment until we have had more experience. We have found it somewhat more difficult to perform some of the steps of the complete mastoidectomy through the endaural route than through the postauricular route.

In this series of cases there has been no perichondritis. The after-care is of course important. The dressings should be be done with the usual sterile surgical technic. After the first four or five days, dressings and bandages are left off and the patient wears only a pledget of sterile cotton in the meatus. He is instructed to change the cotton every hour and always to throw away the first piece and put the second one in the meatus. Because of this rather meager dressing, it seems that infection of the edges of the wound might easily occur. However, unless 1 instance of erysipelas can be ascribed to this source, we have had no such trouble.

Dr. Beck mentioned that in 1 of our patients whom he examined the eustachian tube was definitely closed. I do not know in how many we have obtained this result, but I believe that if the Lempert technic is thoroughly followed the tube will close in a high percentage of cases.

Dr. Salinger talked about the history of the operation. We know that some mastoid surgical procedure was done many years ago by several different men through an endaural route. Just what technic they used and how extensive the work was in the temporal bone I am not prepared to say. I feel sure, however, that the operation on the temporal bone was of quite a different type than that done by Dr. Lempert. Of course, the finely controlled dental burr and modern curets are a great improvement over the more clumsy instruments of an earlier period.

Dr. Glatt mentioned the point that in the radical operation by the Lempert technic a fair-sized piece of skin is discarded. In 1 of our cases, by slight modification of the incisions, this skin was saved. This can be done easily, but on the basis of our experience to date we question the advantage.

It was mentioned that the cavities in our cases in which mastoidotympanectomy was done are smaller than those seen after the usual operation. We do a thorough exenteration of the mastoid process and have a large cavity when we stop the operation. Instead of trying to maintain a cavity of that size we allow the mastoidectomy cavity to granulate in to a large extent and then become epithelized. Therefore we do not have large cavities. We are not always able to control this healing process as we should like, but for the most part we are pleased with the results.

Epithelization takes place from the edges of the canal skin. The new epithelium seems to be of a different type from that seen after many radical operations in which flaps are turned in. It appears to be thinner and apparently has less tendency to desquamate. Of course the smaller cavity is of some advantage, in affording less chance for desquamation and collection of the resulting debris.

Dr. Boettcher, who was one of the first physicians, at least in this area, to use the burr, brought up the question of instruction in the use of the burr. I agree the residents should have instruction and experience in the use of the burr before using it in operations, though I do not feel that it is a hard instrument to use. Our residents have an opportunity to obtain some of this experience on the cadaver, thus combining their experience in the use of the burr with practice in the actual procedures which they will be called on to perform.

The exposure of various areas of the mastoid cavity is facilitated by two maneuvers. Dr. Lempert emphasizes the point that the endaural window is mobile and can be shifted about to different points over the mastoid area. I have been able to do this to some extent, but I want to mention that turning the patient's head is also a great aid in reaching the various areas to be dissected. A good assistant holding the retractors properly has almost complete control of the head, and by shifting the window and turning the head he can greatly facilitate the operation.

GEORGE T. JORDAN, M.D., *President*

WALTER H. THEOBALD, M.D., *Secretary*

Regular Monthly Meeting, Jan. 8, 1940

Laryngocele Ventricularis. DR. J. R. LINDSAY.

Superior external laryngocele occurred in a woman aged 38. The swelling in the neck came on during coughing two months prior to the first examination. There was no pain at first, but the swelling increased steadily until it was about the size of a large hen's egg and then gave discomfort when distended. Reduction could be easily produced by pressure and was accompanied by the sound of escaping air in the throat. Some fluid was present in the sac also, and purulent material was expressed into the throat. The interior of the larynx was normal on examination, both when the laryngocele was distended and when it was collapsed. There was no hoarseness or dyspnea.

The laryngocele was completely removed by external operation, and one year had elapsed with no sign of recurrence.

The etiology of ventricular laryngocele in man is discussed. The exciting cause has apparently been variable; for example, coughing, blowing wind instruments, glass blowing and loud shouting have given rise to the condition. It has occurred in children. It is evident, however, that the important factor in all cases has been an increased intralaryngeal pressure, transmitted via the ventricle to the appendix or saccus, with consequent herniation.

The existence of a predisposing factor, namely, an abnormal development of the appendix, seems probable in view of the relative frequency of the condition in children and women, who would appear to have been less subjected to muscular strain.

Roentgenograms taken by means of the planograph are demonstrated to show the action of the glottis and thereby to explain how increased pressures within the thorax are transmitted to the ventricle of the larynx. The following facts are demonstrated:

1. During physical exertion of the upper extremities, straining or bearing down, the glottis is firmly closed by narrowing at its upper aperture (above the ventricles), as well as by approximation of the true cords. The trachea is dilated, indicating increased intratracheal pressure. The closure provided by the true cords is less capable of resisting pressure from below, and the intratracheal pressure is transmitted to the ventricles.

2. During inspiration the glottis can be closed more efficiently by the true cords, since there is an additional valvular action when the cords come together.

3. The shape of the false cords, as shown by the planograph, precludes any valvular action on their part either on inspiration or on expiration. Closure of the glottis is maintained by muscular action.

During coughing increased intratracheal pressure is utilized, with the upper aperture of the glottis closed during the initial stage. Similarly, during certain types of forced shouting the glottis is closed in the initial stage, thereby providing the increased intralaryngeal pressure. Dilatation of the laryngocele in the reported case was demonstrated under such circumstances.

DISCUSSION

Dr. Frederic E. Templeton: Tomograph, laminograph and planograph are names applied to instruments which by means of roentgen rays project planes of the subjects being examined onto films, obliterating planes above and below by relative motion. The superiority of such roentgenograms to stereoscopic ones of good quality in determining the location and exact nature of certain structures is yet to be proved. One of the best examples of their use is in examination of the anteroposterior projection of the larynx, in which the dense shadow of the cervical portion of the spine is obliterated.

A simple adaptor for my regular roentgenologic table was devised at little cost. A description of the apparatus follows: A metal plate is bolted or fixed with wing nuts in an upright position to the side of the table. The plate contains a slot or a series of holes 1 cm. apart, which runs in a longitudinal direction through the plate at right angles to the table top. A bolt which swivels on a metal block is passed through the groove or one of the holes and is fixed in position by a wing nut on the medial side. The swiveled metal block, fixed on the lateral side or outside of the metal plate, contains a smooth hole, through which runs a rigid rod. This part of the apparatus is known as the fulcrum. The lower end of this connecting rod runs through a slot in another swiveled block which is fixed to a Potter-Bucky grid at the same height and in a direct line to the transverse center of the film as it lies in a Potter-Bucky grid tray. The upper end of the rod is firmly fixed to the tube; any movement of the apparatus keeps the central ray of the tube directed along a plane which runs through the rod. In this way, with the tube over the exact center of the film, with the rod in an exact vertical position and with the fulcrum firmly fixed to the edge of the table, the center of the beam is always directed on the center of the film. The drive is furnished by pulling a cord attached to any of the movable parts, preferably the tube carriage, which moves a short distance along its supports when the apparatus is in motion.

An automatic drive can be devised with additional expense. A strong string can be fixed to the movable tube carriage at one end and anchored to some fixed part at the other end. The carriage is then "cocked" by being moved so that the spring is on a stretch. It is held in position by a magnetic release, which is electrically wired in, parallel with the grid release magnet. An oil chamber, attached to the carriage, will give smooth, even movement in addition to allowing an accurate control of the speed.

In the use of such a machine, the level of the plane desired is obtained by moving the fulcrum up and down to the desired height above the table surface. It must be remembered that all criteria for good images which apply to the making of ordinary roentgenograms apply to this instrument. In addition, other factors enter. Two of these are the absence of any play in the movable joints and the rigidity of the connecting rod. If any play is present, the effect will be the same as when a tube is violently shaken while ordinary roentgenograms are being made.

I do not claim that the results obtained with such an instrument will equal those of any of the commercial machines, but if properly constructed it will give satisfactory service.

Dr. Joseph C. Beck: Some years ago a small group of physicians used to meet each month to talk over our troubles and failures. At one of these informal meetings Dr. Freer was present when Dr. Shambaugh told of a case of prolapse of the laryngeal ventricle in which he was going to operate. The patient had a tumor which appeared on the side of her neck whenever she gave singing lessons. Dr. Freer objected strenuously to the operation, from the standpoint that the procedure Dr. Shambaugh and Dr. Lewis had planned would ruin the patient's "economic voice," an essential physiologic structure for this woman, who had become accustomed to using her voice in the presence of the prolapse. The operation was performed and was reported several months later as being successful. Some time later, at a joint meeting with the Surgical Society, this case was again reported by Dr. Freer, but the operation, he said, was not successful because the scar gave way and the prolapse recurred.

I was much interested in Dr. Lindsay's roentgenologic demonstration. It seems to me that if it is to be complete, and especially as it refers to the work of Negus, it should be supplemented by moving pictures of roentgenograms. I have seen recently a wonderful picture showing the roentgenograms of a person chewing, as photographed from a fluoroscope.

Vertebral Caries in Infections of the Retropharyngeal Space. Dr. G. H. Scott.

The retropharyngeal space lies posterior to the pharyngeal musculature and is limited anteriorly by the deep cervical fascia and posteriorly by the prevertebral fascia. Medially it is divided into right and left compartments by the median raphe. Laterally, it is separated from the pharyngomaxillary space by the thin ala fascia.

Pus in this area usually remains localized to the pharyngeal region but may descend along the fascial planes overlying the longus colli and scalenus muscles to present as an abscess in the posterior triangle or even in the axilla. In some instances the infection follows downward into the posterior mediastinum.

Retropharyngeal abscess may be acute or chronic. Vertebral caries is more commonly seen as the cause than as the result of chronic retropharyngeal abscess.

In the acute form of the disease palpation of the pharynx or even depression of the tongue may produce an alarming interruption of respiration or cause death. Lateral roentgen examination of the neck is a safe and reliable diagnostic method. It at once reveals the extent of the soft tissue abscess, as evidenced by an increase in the width of the retropharyngeal space. At the same time it reveals vertebral caries should such a condition exist.

The cases presented and the conditions which they demonstrate clearly are as follows:

Case 1.—The anomaly was an acute retropharyngeal abscess occupying almost the entire cervical region. Depression of the tongue produced alarming respiratory difficulty. The abscess was drained externally, with the region under local anesthesia. General anesthesia would have increased the hazard. Although good drainage was established externally, the retropharyngeal swelling did not subside entirely. This necessitated incision of the abscess by the oral route as well. Pus under great pressure shot out of the mouth when the incision was made.

CASE 2.—In this case there was a chronic retropharyngeal abscess of three months' duration. It was incised through the mouth and straw-colored fluid obtained. The Wassermann and Kahn reactions were strongly positive. Diagnosis of pharyngeal gumma was made.

CASE 3.—The condition in this instance was a chronic retropharyngeal abscess of three months' duration, which had been mistaken for a cyst and had been injected with iodized oil six weeks before the patient had come to the clinic. As shown by roentgenograms, the iodized oil descended to the posterior mediastinum but the abscess remained localized in the retropharyngeal space. The abscess was incised intraorally, but it recurred and subsided only after diseased tonsils were removed.

CASES 4, 5 and 6.—Case 4 was one of chronic retropharyngeal abscess unrecognized for several months, as evidenced by roentgenograms which had been taken four and one-half months before the patient's admission to the clinic. The pus had presented bilaterally in the posterior cervical triangles. A roentgenogram made on admission showed early erosion of the cervical vertebrae without destruction of the intervertebral disks. This is in sharp contrast to case 5, which is a case of cervical Pott's disease with retropharyngeal abscess. In this instance the collapse of the intervertebral disk is an outstanding feature. The destruction of the intervertebral disks is even better shown in case 6, also one of cervical Pott's disease.

The erosion of the vertebrae continued in case 4 even though through and through drainage was established in the neck. A posterior mediastinitis developed and was drained through the back. The patient died of pulmonary embolus. All tests, including guinea pig inoculation, failed to reveal any evidence of tuberculosis. This case is obviously one of vertebral caries secondary to a nonspecific infection of the retropharyngeal space.

DISCUSSION

DR. ARTHUR PROETZ: I do not know when I have encountered such an instructive series of cases as those just presented or such an instructive series of roentgenograms. It occurred to me while Dr. Scott was talking that it would be extremely useful in interpreting the advancement of these infections and the behavior of some of these swellings if differentiation were made between the retropharyngeal and the prevertebral spaces, as should be done. As a matter of fact, in the textbooks anatomists almost never do so, or if they do, it is merely in passing. However, the spaces are quite distinct. The fascia which separates them is thin and tough. The retropharyngeal space stops at the carotid sheath, whereas the prevertebral space spreads around to the side and ends where the nerve roots emerge, and this may have something to do with occipital headaches and rigidity of cervical muscles. The longus colli and longus capitis muscles lie within this space, and the roots of the brachial plexus are in contact with it. The muscle attachments to the skull and the atlas, respectively, constitute the upper delimitation, and the lower is the upper margin of the mediastinum. The case Dr. Scott mentioned in which he opened the abscess through the neck externally and found after a day or so that the drainage was not sufficient indicates that the retropharyngeal space was drained and the prevertebral perhaps only buttonholed. When the abscess was opened through the pharynx the space was reached and proper drainage accomplished.

The roentgenogram of the patient in whom iodized oil was injected shows this space beautifully. The iodized oil lay close against the vertebral column and did not fill the whole abscess cavity. The tough membrane is often the thing that prevents the abscess from draining and is the determining point between drainage and extension. I have seen in 1 case at autopsy infection of the diagastric space through perforation of the mastoid tip. The infection invaded the prevertebral space, broke down the attachment at the midline, went up on the other side through the forament magnum near the vertebral artery, formed an abscess there and killed the patient.

The existence of these two spaces is not theoretic. If the cadaver is sagittally sectioned a little to one side of the midline and a stream of compressed air is allowed to play over the sectioned surfaces for a few moments, the spaces lay themselves open and show definitely how infection may appear in one space without invading the other.

DR. G. H. SCOTT: I wish to thank Dr. Proetz for his intelligent discussion of this subject. His distinction of the prevertebral and retropharyngeal fascial spaces offers an explanation as to why the injected iodized oil descended into the thorax while the pus lying anterior to it in the retropharyngeal space remained localized in the pharyngeal region.

Eustachian Tube: Abnormal Patency and Normal Function. DR. H. B. PERLMAN.

While much treatment is directed to the eustachian tube, knowledge of its functions and methods for determining them have been remarkably static for the last half-century.

One can learn a great deal about the function of the eustachian tube by studying the patients with the syndrome usually referred to as the continually open eustachian tube. A moving picture is shown of a thin, atrophic drum moving synchronously with respiration in a patient with an open eustachian tube. A valuable adjunct in studying cases of this syndrome as well as those of other otologic conditions involving the eustachian tube is the use of a simple quantitative method for studying patency of the eustachian tube. This technic entails chiefly the employment of the ordinary wall manometer of a blood pressure apparatus. Definite minimal pressures for inflating the normal tube by Valsalva's maneuver are established for this method. A great decrease in this pressure was found in the group of patients with the open eustachian tube when the tube was temporarily closed and the patient free of symptoms. It was found that the reclining position greatly increased the resistance of the tube in the normal subjects as well as in those with the open eustachian tube and in patients with suppurative ears, so that the highest pressures that the patient could produce were inadequate to open the tube. Exercising decreases the resistance of the tube in normal persons and in those with suppurative ears. Abnormal patency of the eustachian tube was found in subjects who had involvement of the fifth motor nerve following a retrogasserian neurectomy. New experimental equipment used to study the function of the eustachian tube and the records obtained are briefly described and illustrated by lantern slides.

In conclusion, a moving picture is shown of movement of the eustachian cushion in the human being, taken through a large defect in the hard palate when the subject was forming the sound "ah" and when he was swallowing.

Cranial and Intracranial Complications of Acute Frontal Sinusitis. DR. PAUL C. BUCY and DR. W. TRACY HAVERFIELD.

Three cases of acute frontal sinusitis which developed immediately after swimming are presented. In the first an extensive osteomyelitis of the right frontal bone and an abscess of the right frontal lobe occurred. The patient was admitted to the hospital two and one-half months after the onset, in a semicomatose state. Drainage of the abscess and removal of the osteomyelitis in three stages resulted in recovery, though vision was rather seriously impaired. In the second case the right frontal sinusitis appearing immediately after swimming was soon complicated by an osteomyelitis which was quickly relieved by extensive extirpation one month after the swimming. There were no intracranial complications. In the third case it was a *left* frontal sinusitis that appeared after swimming. Though no osteomyelitis developed, an abscess of the *right* frontal lobe soon appeared. This patient recovered after drainage of the abscess about three months after the swimming.

A fourth case is presented, in which a localized osteomyelitis along the course of the *left* anterior temporal diploic vein developed after an abscess beneath the

left temporal muscle. Shortly thereafter an abscess developed in the *right* cerebral hemisphere beneath the central region.

These cases being used as a basis for discussion, it is pointed out that:

1. Extension of the infection from the sinus is usually via the frontal and the anterior temporal diploic vein to the frontal bone, thence intracranially through small emissary connections into the superior sagittal sinus and down one of the connecting veins into the cerebral hemisphere of the same or the opposite side.

2. Prophylactic measures must be directed toward prevention of the sinusitis itself as well as of spread of the infection beyond the sinus.

(*a*) Development of sinusitis as a result of swimming can be in some measure prevented by (1) proper breathing, (2) proper diving, (3) use of nose clips and (4) avoidance of chilling. (*b*) Avoidance of spread of the infection from the sinus once a sinusitis has developed may be attained by prompt, adequate, external drainage of the sinus in those patients in whom local pain, tenderness and swelling over the sinus, associated with fever, develop after swimming.

3. All acute osteomyelitis of the skull should be treated by wide excision of the infected bone as soon as the diagnosis is made. It is not possible to rely on the roentgenograms for diagnosis if prompt treatment is to be instituted, as they do not show change until ten or twenty days after the onset of the infection of the bone. The diagnostic sign of the development of this complication is edema of the forehead spreading upward from the sinus.

4. Abscess of the brain should be treated by prompt aspiration and drainage, with careful attention to the protection of the meningeal spaces from infection by obliterating them about the field and not operating through an infected field.

5. The bony defect resulting from extirpation of the osteomyelitic bone is usually spontaneously repaired by regeneration of bone.

DISCUSSION

DR. THOMAS GALLOWAY: Dr. Bucy gave an illuminating discussion, especially as to the distribution of the diploic veins. One assumes that in most of the patients with abscess of the brain whom Dr. Bucy has had the conditions are more chronic than the ones seen in otolaryngologic practice, an assumption which raises the question as to the time of operation for such an abscess. Should one wait for localization? I now have a patient, a boy presenting a history of a cold twelve days before, who entered the hospital with a perforating frontal sinusitis. A simple drainage was done at the external angle and at the internal angle with trephine of the sinus and considerable pus obtained under pressure. In three days he had a crossed weakness of the arm and a crossed paralysis of the facial nerve. His general condition was good. A Killian operation was done in order to expose the dura, and that membrane was glistening and smooth. Eight days after the apparent onset of frontal sinusitis the first localizing symptoms really suggesting intracranial complications were seen. Today the patient is sluggish mentally and does not answer questions well. There are 106 cells in the spinal fluid. What would Dr. Bucy do in such a case? As to frontal sinusitis, I think most rhinologists believe that early operation, if it cannot be avoided, should be restricted as much as possible, and I think I encounter more cases in which complications develop from early operation than cases in which complications are prevented by early operation. I have tried to avoid intervention during the first seven days if it is possible.

DR. T. E. WALSH: I should like to emphasize what Dr. Bucy said about intervention in these conditions when they become chronic, that is, when chronic frontal sinusitis is associated with osteomyelitic changes in the bone. I recently have had as a patient a man with roentgen evidence of thickening of the bone of the periphery of the sinus and with definite evidence of clouding of the frontal sinus. A radical frontal operation was done, and the bone was found to be only slightly roughened along the lateral margins of the supraorbital ridges. I made the mistake of not operating radically enough. Osteomyelitis developed, and I have had to remove most of the cranial vault. The patient is alive; I do not

know why. When operation is performed on a patient whose condition is suggestive of osteomyelitis, it is worth while to do a radical removal of a bone in the first operation. In general I am against radical surgical treatment, but I think in such cases it is essential. I agree with Dr. Galloway that "hands off" for the first few days of an acute frontal sinusitis is best. I find that if one intervenes surgically in acute frontal sinusitis more trouble is apt to result than if conservative treatment is used.

DR. FRANCIS LEDERER: Some one else might have given this same presentation from a different angle and reversed the order in which the patients came to the specialist. Conservatism in the early days seems to have been the usual attitude from a rhinologic standpoint. Many of the cases discussed by Dr. Bucy have been presented to illustrate the result of too early surgical intervention. How does one know when to intervene in cases of this kind? One can find in one's own practice and in the literature just as many instances in which it can be said that complications such as abscess of the brain are due to early intervention as those in Dr. Bucy's series in which such complications can be ascribed to late intervention. It is essential to distinguish two kinds of osteomyelitis: a virulent, fulminating type (rapid, or acute) and the type with which Dr. Bucy was mainly concerned (chronic, or slow). To my mind, therefore, they offered the positive good results which he obtained. I can well imagine intervening surgically in those conditions on the appearance of the puffy swelling, having the same complication occur and attributing it to too early intervention. I still do not believe that the treatment of these lesions can be stereotyped and that it can be said positively that in all instances operation must be done early or that early intervention will prevent this intracranial picture. I think judgment should be based on the virulence or the chronicity of the condition. Further, I believe that most rhinologists agree that they do not like to incise an area of spreading osteomyelitis too early. Clinical signs and roentgenologic investigation give no absolute index as to the microscopic spread of the process. One can well understand that the process is constantly advancing one step ahead of the scalpel. When the condition has existed for weeks or months before the patient comes to operation, there is an excellent opportunity to remove osteomyelitic bone and achieve the same results Dr. Bucy did. On the other hand, when the osteomyelitis is acute and just one step ahead of the scalpel, the operator feels that the possible outcome is not quite so certain as one would be given to believe by his excellent results. The swimming problem is important and worthy of the emphasis given by Dr. Bucy. My associates and I had at one time 3 patients with osteomyelitis that followed swimming. I believe prophylaxis should be emphasized in combating this complication.

DR. JOSEPH C. BECK: Dr. Bucy commented on the loophole that Furstenberg left in his report as to regeneration of bone after cranial operations. I should like to have Dr. Bucy say something about complications, such as epilepsy, following the extensive removal of bone. I am referring to a case of extensive osteomyelitis in a boy the greater part of one side of whose skull was removed. The patient made a splendid recovery, but epilepsy developed. Several months after operation the roentgenogram of the defect was studied and evident regeneration of bone was found, which one could also feel. The neurologic surgeon called in advised the exploration of this region for the cause of epilepsy. When he exposed this area I was delighted to see how much bone had regenerated to cover the defect. He removed some particles of this so-called bone, and I have sections to show there was not one bit of bony structure in what the roentgenogram and palpation showed to be bone. It was dense and calcified tissue, but there was no real bone. Differentiation must be made between these two, and I think it makes a difference as to what cover the brain has afterward. I should like to hear from Dr. Bucy specifically about that. Furstenberg, I believe, called attention to some of his cases in which there were jacksonian symptoms.

DR. PAUL C. BUCY: In reply to the first question, I do not believe that the infection spreads by way of dural vessels. I think it can be seen from these roentgenograms that it is spread by vessels between the two layers of bone

within the diploe. As a matter of fact, there are few vessels in the dura mater. The diploic veins do eventually pass through the dura mater, but I should hardly call them dural vessels.

As to the time of operation for abscess of the brain, this is a point on which I am in disagreement with many neurosurgeons. A year ago I published the results in 17 consecutive cases, with recovery in 70 per cent (Bucy, P. C.: Treatment of Brain Abscess, *Ann. Surg.* **108**:961-979, 1938). According to my experience, the time to operate on an abscess of the brain is at the time of diagnosis, and that has been my practice. I have had patients operated on within twelve days after the earliest possibility of infection who made a prompt and complete recovery. That is now common. In most cases the disease is of considerably longer duration before operation, and I think there is undoubtedly a measure of safety in having a longer period elapse. There is no question but that more attractive statistics on operative mortality can be obtained by waiting, as the patients with the more virulent, rapidly progressive infections will then die before coming to operation. That is why McEwen had such excellent results. He was dealing in every case with a chronic, well localized and well encapsulated abscess of the brain. I am sure, however, that many of the patients with the more acute form of the disease can be saved by prompt drainage and that the mortality for all cases of abscess of the brain can be lowered by such treatment, even though the operative mortality is raised.

As to operation on the frontal sinus for drainage, I do not feel competent to say exactly what operative procedure should be followed. You are better judges of that than I. I am inclined to believe that the operation should be as limited as possible and yet achieve adequate drainage. Obviously it is of no advantage if it does not.

I am familiar with Dr. Walsh's case, and I am sure that he should be complimented on "still having the case." The condition has been an extremely difficult one and has been handled well.

As Dr. Lederer has said, roentgenograms similar to these have been shown in the past and the osteomyelitis has been attributed to an operation on the sinus, merely because it followed operation. Frequently that is an incorrect interpretation, for, as has been shown here, such osteomyelitis does develop spontaneously as a result of acute frontal sinusitis which follows swimming. I have always looked on chronic osteomyelitis as of much longer duration than in these instances. In the second case the entire history covered only a month and the osteomyelitis was of two weeks' duration. In the other case the osteomyelitis had been present a little longer and was therefore much more extensive. I agree that there are two types of osteomyelitis, the chronic localizing type and the diffuse spreading type, but I am not able to tell which is going to develop, and it is my feeling that in every instance the osteomyelitis should be widely excised.

With reference to Dr. Beck's discussion, although such complications as epilepsy do occur after osteomyelitis, they are not common, but after abscess of the brain convulsions are an extremely common as well as an unfortunate and disagreeable complication. Undoubtedly in such cases the convulsions are related to the scar formation which follows drainage of the abscess. It would therefore appear logical to treat such convulsions by removing the scar, as one does in traumatic cases. Unfortunately infection often follows an attempt to take out the scar. The scar harbors infection for months and years after all evidence of infection has disappeared. The same organisms have been recovered from the scar tissue years after the abscess has been successfully treated. Attempts to remove the scar have resulted in meningitis, and I think attempts to remove such scars have been discontinued. The convulsions which follow osteomyelitis alone are more difficult to understand. I have observed 1 case in which the subdural space was obliterated; the dura mater and the pia-arachnoid were adherent to the surface of the brain, and I feel sure that that was the cause of the convulsions. As to regeneration of bone, undoubtedly there are cases in which only calcification develops, but I am sure Dr. Beck has encountered many cases, as I have, in which there has been a replacement of bone itself.

Book Reviews

The Displacement Method of Sinus Diagnosis and Treatment. By Arthur W. Proetz, M.D., Professor of Clinical Otolaryngology, Washington University School of Medicine, St. Louis. Second edition. Price, $6.00. Pp. 296. St. Louis: Annals Publishing Company, 1939.

Though the method described in the first edition has not been changed, the second edition of Dr. Proetz's monograph has brought certain details up to date, necessitating a thorough revision as well as a complete resetting of type. The literature, both of the United States and of foreign countries, is reviewed; many comments and controversial matters are discussed, and twelve new illustrations have been added.

The volume now contains a bibliography of 226 references, and 32 pages are devoted to a review of the literature. There are 296 pages in all, the entire subject matter being covered in twenty chapters.

The author starts with a full discussion of the fundamentals of sinus filling and displacement, the anatomic, physical and physiologic considerations thereof and the pathology and theory of treatment, and then he deals at length with solutions and radiopaques. A complete dissertation on the roentgenologic procedures is presented in several chapters, suitable illustrations augmenting the value of the text. Every means of sinus diagnosis by the displacement method, the varied technics and kindred data concerned in obtaining accurate filling of the sinuses with radiopaque mediums and evaluation of the roentgen studies, these and many more matters are thoroughly covered in designated chapters. Further chapters include those on interpretations, sources of error and observation of allergic changes in the sinuses by means of radiopaque mediums; a number of case records are cited. The entire format, including type and binding, of the monograph is excellent.

The first edition of this work was awarded the Casselberry prize of the American Laryngological Association in 1931, and the present volume likewise represents Dr. Proetz's great contribution to American otolaryngology, for which he deserves the highest praise.

This book is recommended to all physicians, especially the otolaryngologist and the roentgenologist, as well as to graduate students and resident physicians in either of these specialties, and its message is so valuable that it merits the attention and careful study of any reader.

Argyria, The Pharmacology of Silver. By William R. Hill, M.D., Instructor in Dermatology and Syphilology, University of Pennsylvania, and Donald M. Pillsbury, M.D., Associate Professor of Dermatology and Syphilology, University of Pennsylvania. Price, $2.50. Pp. 172. Baltimore: Williams & Wilkins Company, 1939.

The authors have skilfully and accurately brought the clinical entity, argyria, up to the minute in a fairly concise yet complete monograph of 133 pages. Not only is the subject critically reviewed, but a complete bibliographic reference to date is given, covering practically every phase of the subject. It is particularly timely because of the widespread use and application of silver preparations for an increasing assortment of ailments. The importance of proper dosage, compounds in general use, modes of administration, preparations most frequently used, and other such matters are critically investigated, and conclusions are based on scientific evaluation and determinations. The volume is of value to the general practitioner and to the specialist alike, since it not only concerns itself with the detailed clinical aspect of the subject but incorporates perhaps the best chapter written so far on the pharmacophysiologic effects of the administration of silver.

Every effort is made to evaluate precisely conclusions based on theory, conjecture and established fact, recognized value being given to each only when its status and basis are convincingly accurate. Since argyria is permanent and commonly produces unsightly discoloration in exposed parts, it may take on a medicolegal aspect commensurate with the psychologic and social makeup of the person affected. A note of warning is sounded against the unbridled and prolonged use of silver preparations, and the authors feel that pharmacists should give clearly, by label, adequate warning regarding argyria.

The authors deserve congratulations on this valuable book.

The Diagnosis and Treatment of Diseases of the Esophagus. By Porter P. Vinson, M.D. Price, $4. Pp. 224. Springfield, Ill., Charles C. Thomas, Publisher, 1939.

Dr. Porter P. Vinson's book is indeed a much needed and worthy contribution to the present medical literature. The book is subdivided into sixteen chapters. The style is straightforward and clear. The book should be read by many members of the medical profession in general practice, so that they may become better acquained with the large variety of esophageal lesions and especially with the fact that although malignant growth is always to be suspected, many other conditions may exist which are benign and respond to treatment.

The reviewer has the greatest respect for Dr. Vinson's conservative attitude in regard to the treatment of these conditions, for esophagoscopy is a delicate method and surrounded with danger even in the hands of the best trained physician. On the other hand, the reviewer is not in direct accord with some of Dr. Vinson's ideas, especially on the differential diagnosis of esophageal lesions by blind bougienage. With the perfected instrumentarium at the disposal of physicians today, the direct visualization of conditions thought to be pathologic by the open tube method is invaluable.

Although the entire book reflects the author's wide range of personal experience, he has included at the end of each chapter an excellent bibliography, extremely useful for collateral reading to physicians particularly interested in this field. Dr. Vinson is especially to be commended for his extensive drawings and roentgenographic reproductions. It is hoped that this book will be accorded the warm reception it justly deserves.

News and Comment

American Congress of Physical Therapy.—The nineteenth annual scientific and clinical session of the American Congress of Physical Therapy will be held Sept. 2 to 6, 1940, at the Hotel Statler in Cleveland. The mornings will be devoted to an annual instruction and the afternoons and evenings to scientific sessions. There will be symposiums dealing with light, heat and electricity as important therapeutic adjuvants in general medical and surgical practice.

Further information may be procured by writing directly to the Congress, 30 North Michigan Avenue, Chicago.

Directory of Otolaryngologic Societies *

NATIONAL

American Medical Association, Scientific Assembly, Section on Laryngology, Otology and Rhinology

Chairman: Dr. Leroy A. Schall, 270 Commonwealth Ave., Boston.
Secretary: Dr. Louis H. Clerf, 1530 Locust St., Philadelphia.
Place: Cleveland.

American Academy of Ophthalmology and Otolaryngology

President: Dr. Frank Brawley, 30 N. Michigan Ave., Chicago.
Executive Secretary: Dr. William P. Wherry, 1500 Medical Arts Bldg., Omaha.
Place: Hotel Cleveland, Cleveland. Time: Oct. 6-11, 1940.

American Broncho-Esophagological Association

President: Dr. Lyman Richards, 319 Longwood Ave., Boston.
Secretary: Dr. Paul Holinger, 1150 N. State St., Chicago.
Place: Waldorf-Astoria Hotel, New York. Time: June 5, 1940.

American Laryngological Association

President: Dr. James A. Babbitt, 1912 Spruce St., Philadelphia.
Secretary: Dr. Charles J. Imperatori, 108 E. 38th St., New York.
Place: Westchester Country Club, Rye, N. Y. Time: May 27-29, 1940.

American Laryngological, Rhinological and Otological Society, Inc.

President: Dr. Lee M. Hurd, 39 E. 50th St., New York.
Secretary: Dr. C. Stewart Nash, 708 Medical Arts Bldg., Rochester, N. Y.
Place: Waldorf-Astoria Hotel, New York. Time: June 6-8, 1940.

SECTIONS:

Eastern.—Chairman: Dr. John R. Simpson, Medical Arts Bldg., Pittsburgh.
Southern.—Chairman: Dr. Walter J. Bristow, Doctors Bldg., Columbia, S. C.
Middle.—Chairman: Dr. Sam E. Roberts, Professional Bldg., Kansas City, Mo.
Western.—Chairman: Dr. Pierre Viole, 1930 Wilshire Blvd., Los Angeles.

American Otological Society

President: Dr. Horace Newhart, 527 Medical Arts Bldg., Minneapolis.
Secretary: Dr. Thomas J. Harris, 104 E. 40th St., New York.
Place: Westchester Country Club, Rye, N. Y. Time: May 30-31, 1940.

* Secretaries of societies are requested to furnish the information necessary to keep this list up to date.

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